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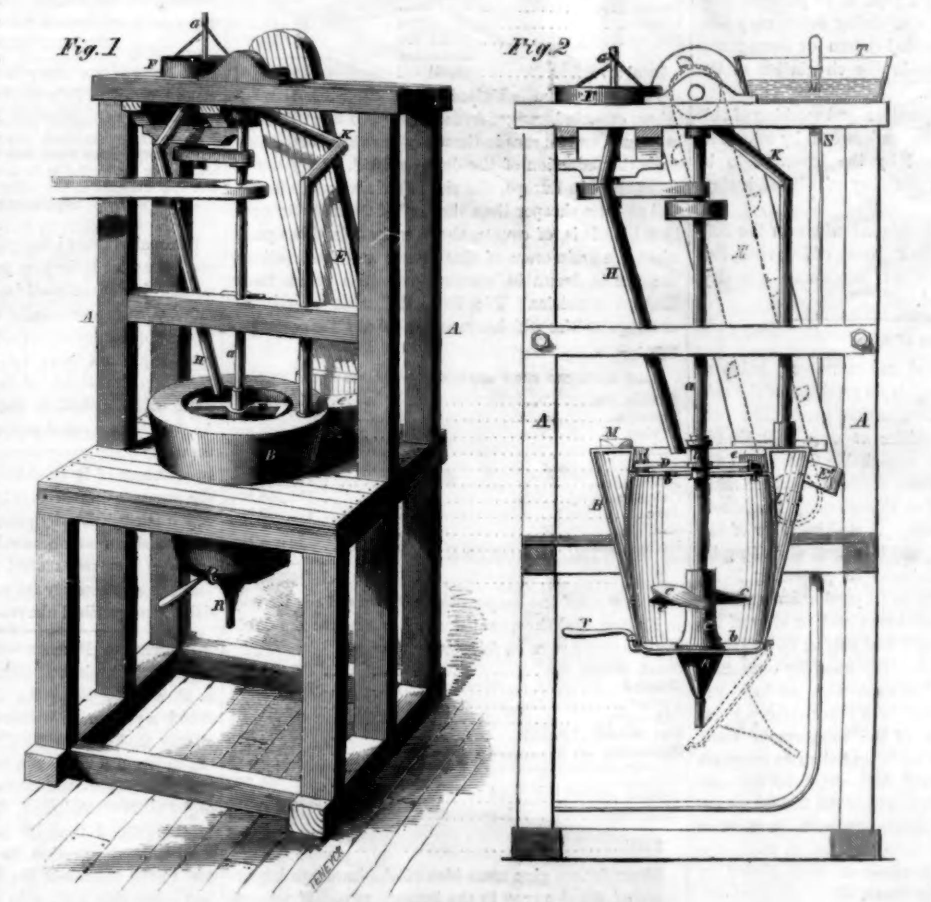
Improved Rice Mill.

Rice has been called "the universal food of man," and with much propriety, as it is more generally used as an article of diet than any other vegetable product. [Some very interesting statistics respecting the rice crop of various countries, and the modes of using it, will be found on the succeeding page.] As rice is mostly the product of tropical and intertropical countries, nature has provided the kernel of it with a very tenacious coat of husks, which afford it protection against the attacks of various insects that abound in those regions. These coatings also serve the benign purpose of preventing the rice from becoming unduly heated when transported dry in bulk to distant countries. It is, therefore, now generally shipped in husk, but, in order to prepare it for marketable purposes, the husk or coating has first to be removed from the clean, beautiful kernels or grains.

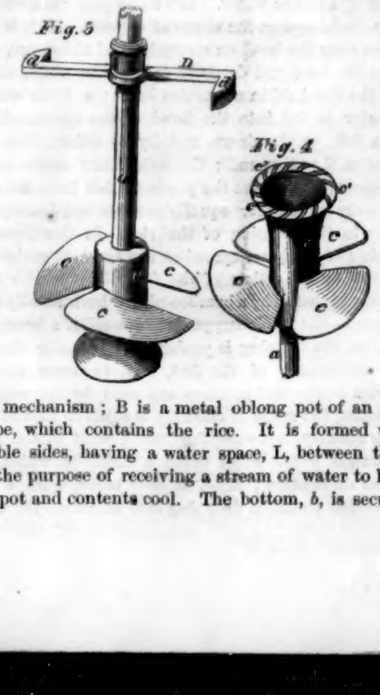
The mechanism which has hitherto been usually employed is very rude, and far from being efficient for the purpose. In its rough state, rice is called *paddy*, and the coarse outer husks are removed by careful rubbing between stones, which leave the inner coat or cuticle still adhering with great tenacity, and its removal requiring very peculiar modes of operation. It is customary to do this by a beetling process, pestles being elevated and allowed to drop successively into the rice, which is deposited in a mortar, until the cuticle is separated. This process is very slow, and involves much waste by breaking the grains. Experience has demonstrated that the best way to remove the inner cuticle of rice is by attrition or the rubbing of the grains against one another. By this process, however, the rice is liable to become so heated by the friction generated by the rapid movement of the kernels against one another as to become quite brittle, in which condition much of it is liable to be broken; thus greatly diminishing its marketable value, besides no inconsiderable portion of it is carried off in the chaff.

The improved rice cleaning machine represented by the accompanying engravings is entirely different in its construction and operation from the rice beetling machines; it operates upon the rice by attrition, through the instrumentality of a revolving section screw and a flaring hub, ample provision being made for keeping the rice from becoming overheated by introducing cold water between the inner and outer casings of the pot, so that the operation may be performed rapidly, and the scouring of the rice effected in a superior manner, with very little waste, as may be inferred from the following description of the machine.



KASE'S IMPROVED RICE MILL.

Fig. 1 is a perspective view of the machine; Fig. 2 is a vertical section; Fig. 3 is a view of the revolving attrition screw, with refrigerating scoops on its shaft, and Fig. 4 is a perspective view of the screw hub in an inverted position, to show the minute channels on its under edge to admit air in from below to the center of the mass. Similar letters refer to like parts on all the figures. A represents a strong frame for supporting



the mechanism; B is a metal oblong pot of an egg-shape, which contains the rice. It is formed with double sides, having a water space, L, between them for the purpose of receiving a stream of water to keep the pot and contents cool. The bottom, *b*, is secured by a hinge to the pot at one side, and held by a suitable lever catch, *r*, at the other. A nozzle, R, is inserted into the center of the bottom for air to pass freely up into the mass; *a* is a vertical shaft mounted in suitable bearings in the frame, and extending down through the center of the pot to its bottom; C is a hub secured upon its lower part. There are three sectional screw blades, *c c c*, secured on the hub, and it is of a trumpet or flaring shape. On its under edge are a series of narrow air channels, *c'*, inclined in a direction contrary to the rotation of the shaft. The hub rotates close to the bottom of the pot, and neither rice nor chaff can get under it.

Operation. — The pot being filled with the rice, the shaft, *a*, is set in motion and made to rotate rapidly. The rice is subjected to a complete rubbing and scouring action, and a constant circulation of all the grains is carried on from the top down at the center, and upward at the sides. It is drawn into the center, and passes through the spaces between the blades, *c*, and is rubbed between them and the smooth bottom; thence it is forced outward toward the circumference, and is driven upward to the top along the sides. By this mode of attrition, the inner cuticle of the rice is rapidly removed and a complete scouring action effected, so as to produce beautiful, clean and smooth kernels. It will be observed that, by the curvature or flare of the hub and smooth bottom of the pot, the circulation of the rice and the effectual rubbing of the grains upon one another are secured. A very great pressure is exerted by the superincumbent column of rice upon the bottom and yet it is evident that a complete circulation, with a powerful rubbing action, are combined in the operation. When this operation is effected, the shaft is stopped, and the bottom opened by unfastening the catch, *r*, as shown by the dotted lines, when the rice drops below into a receptacle provided for it.

This mode of cooling the pot will generally be sufficient, but as some kinds of rice—such as that of Cuba and the Indies—are more difficult to clean than that of South Carolina, it may be sometimes necessary to drive the mill with a very high velocity, thus causing increased friction and heat among the grains of rice. Other refrigerating appliances are also represented, which may be employed or thrown out of gear by a clutch on shaft, *a*, according to circumstances. These appliances consist of an arrangement for carrying up the rice regularly while being rubbed, and exposing it to the air to cool; then conveying it down again in a stream to the center of the pot, so as to secure a complete cooling and attrition circulation at the same

time. A flange, *b*, encircles the inner side of the post, near its top; the scoops, *d*, on the cross arms, D, on the shaft, *a*, as they revolve, catch the rice as it rises to the top at the sides, and sweep it into the inclined trough, E', through the opening, *e'*. An elevator, E, then carries the rice up to a cooling tub, F, which has a double bottom, forming a space through which a stream of water circulates. A vertical shaft, G, in the tub, F, has a series of spreaders or rakes on it, which scatter the rice, and, as they revolve, the grains are carried gradually from the sides to the center in a spiral course and exposed to the air. After this, they drop down by the tube or *hopper boy*, H, into the center of the pot to go through the scouring process again; and so on, until the rice is perfectly cleaned. The water for cooling purposes is first conducted from the cistern, T, around the bottom of the cooling tub, F; and from thence it descends through pipe, K, to the water space, L, and then it passes out by a waste pipe, M. The same water may be caught in a cistern, cooled with ice, and pumped up through, pipe, Z, to perform duty over again. Coiled pipes, containing water, may also be used, and either an elevated cistern or force pump may be employed to maintain the circulation of the water in the cooling spaces.

We have described the operation and working of this machine so that it will be understood by all. The same mechanism is claimed by the inventor to be equally applicable to the scouring of wheat, barley, coffee, &c.

A patent was granted for this invention on the 20th of November last, to Simon P. Kase, of Danville, Pa., but who has an office at No. 61 Ann-street, this city, where he may be addressed.

Statistics of Rice.

Rice, as an article of food and commerce, holds an important place among the staple products of the soil, and, in view of the enormous annual production (estimated by the best authorities at over 100,000,000 bushels), it is not a little remarkable that, up to the present time, no improvement whatever has been made upon the rude and imperfect rice-cleaning machinery in use hundreds of years ago. A striking view of the rice business of the world, and the necessity of rapidity, economy and thoroughness in preparing it for market, and a few statistics on its production and consumption, will be of interest here; and, in view of the great dependence so generally had among those (Eastern) nations upon rice as food, the quantity consumed has not been estimated less than 3 oz. per head per day—or, in round numbers, 70 lbs. per head per annum. The latest returns of the numbers in those countries give 691,343,916 souls, and the rice crops are estimated at 62,176,062,000 lbs.—about 50 per cent greater than the Indian corn crop of the United States.

The following are the number of persons in the East whose food is chiefly rice, either grown on their own soil or purchased from each other:—

RICE COUNTRIES.

	Population.	*lbs. consumed per annum.*
China	450,000,000	40,500,000,000
Hindoston	134,301,000	12,060,000,000
Ceylon	1,710,000	153,100,000
Mauritius	192,000	17,280,000
Japan	50,000,000	4,500,000,000
Sumatra	3,000,000	270,000,000
Phillipine	4,200,000	361,000,000
Java	6,000,000	540,000,000
Cochin China	15,000,000	1,350,000,000
Siam	3,000,000	270,000,000
Burmah	4,000,000	860,000,000
Araccan	500,000	45,000,000
Beloochistan	3,000,000	270,000,000
Malabar	1,140,916	102,682,000
Malay	300,000	27,000,000
Assam	15,000,000	1,350,000,000
Total	691,343,916	62,176,062,000

These countries produce other grains and articles of food to some extent; but rice is the chief fare, and when flesh is used, it is usually cooked with rice. The consumption of the above countries being about 62,176,000,000 lbs., there remains for export a considerable quantity, which finds its way to the countries of Europe to a greater or less extent, according to the rates of freight or the dearness of food in Europe.

In addition to the rice-producing countries mentioned in the above table, we may state that the Italian States grow rice largely, exporting, on an average, an amount valued at about 8,000,000f. Portugal grew, in 1851, 11,000,000 lbs.; Spain grows it extensively on the coast of the Mediterranean; Russia produces a hardy variety of rice on the coast of the Sea of Azof and the Black Sea; Austria grew, in 1841, 105,000,000 lbs., chiefly on the coast of the Adriatic. In Egypt and on the island of Borneo, rice is grown in large quantities. The Cape Verde and Ionian Islands, European and Asiatic Turkey, Greece and the States of Brazil, New Grenada, Venzuela, La Plata, Paraguay, Uruguay and the Guineas, in South America, produce rice—and, in some portions of their territories, in considerable quantities.

The crop of the United States, according to the national census, was, in 1840 and 1850, as follows:—

RICE CROP OF THE UNITED STATES.

	1840.	1850.
Alabama, lbs.	149,019	2,312,252
Arkansas	5,454	63,179
Georgia	12,384,732	39,950,671
Illinois	460	601
Kentucky	16,376	5,688
Louisiana	3,604,534	4,425,349
Mississippi	777,190	2,719,856
Missouri	50	700
North Carolina	2,820,388	5,465,868
South Carolina	60,590,861	159,930,613
Tennessee	7,977	258,854
Texas	—	88,203
Virginia	2,986	17,154
Florida	481,420	1,075,690
Total	80,841,422	215,213,497

The surplus of the United States, one year with another, exported, ranges from $2,000,000 to $2,500,000 in value; and its uses in Germany have much increased since the reduction of the duty in 1838. In years of short crops in Europe, the rice of Asia comes in freely, and at rates cheaper than the United States article can be sold. It is, of course, the case that, in those years when the grain crops of Europe fail and food is dear, the rice is drawn in greater quantities from those Eastern countries. The following table shows the usual quantities which annually find their way to Europe:—

RICE EXPORTED FROM LEADING PRODUCING COUNTRIES.

Manilla, lbs.	18,340,000
Sumatra	90,000,000
Ceylon	70,000,000
Malabar	216,000,000
Akyab	181,440,000
Maulmain	157,500,000
Calcutta	734,960,000
Java	122,000,000
Sardinia	24,100,000
United States	45,000,000
Total	1,659,340,000

A very considerable portion of this rice finds its way to Europe, and the quantities imported into the leading countries were as follows:—

Great Britain, lbs	413,096,900
Holland	110,511,201
France	70,000,000
Zollverein	60,799,191
Switzerland	12,547,311
Denmark	7,788,452
Greece	1,387,144
Bremen	15,101,000
Lubec	1,191,104
Hamburg	3,500,000
Total	696,021,403

These figures give some idea of the immense importance of the rice crop to the human race. If we contemplate the details of the trade, we are struck with the fact that, in the preparation of an article of such prime importance for the market, no advance—not even in the middle of the nineteenth century—has been made above barbarism.

The Chinese mode of cleansing is to work the rude pestle by hand or water. The water power is a wooden beam, fashioned in the shape of a spoon. This is supported near the bowl on an upright of about two feet. From the long end depends the pestle, which drops into the rice held in a wooden basin; a little stream of water is led into the bowl of the spoon, which, when full, weighs down, and, by so doing, lifts the pestle at the other end; the water then spills out of the spoon, and allows the pestle to fall into the rice. There are some other equally curious applications of power to the cleaning of the rice. In Sumatra, the bunches of *paddy* are spread on mats and the grain rubbed out by the action of the feet, the operator supporting his hands by a bamboo placed horizontally over his head—the whole suggestive of a sailor's hornpipe. In Java, the cleaning is performed by equally dexterous movements of the feet, but, to some extent, wooden pestles and mortars are used by the women. In Japan, the mode of cleaning is equal to that of any other country, not excepting the United States. An undershot water wheel turns a shaft, to which are affixed short arms; these, as they move, work a row of wooden pounders dropping into mortars—the same as may be seen, less artistically made, working for the same purpose in New York to-day, as follows: the rice is first run through a pair of heavy millstones about six feet in diameter, at the rate of 100 bushels per hour, which grinds off the hull; thence into large wooden mortars, which hold about 2½ bushels each, in which it is pounded by large iron-shod pestles, weighing from 300 to 400 lbs., for the space of some two hours. The pounded rice is then elevated and passes through a vertical brushing screen revolving rapidly, which polishes the flinty grain; from thence it descends through a rolling screen to separate whole grains from the broken, and flour from both, and delivers it fully prepared into the barrel or tierce which is to convey it to market.

This is the present process in the United States, where, upon the whole, it is done better than any part of the world. The loss by this mode of cleaning is over 30 per cent, of which one-half is incurred by breaking and pulverizing the rice. All the rice imported into the United States from other countries require to be recleaned before it becomes marketable.

WHITE GUNPOWDER.—A letter from London says: "I have heard in this city of a curious invention, which concerns alike sportsmen, riflemen and the scientific. It is the manufacture of white gunpowder. It is made no mystery of, being composed of yellow potass, chloride of potassa, loaf sugar, crystallized sugar and brimstone. It possesses superior qualities over the black powder, being quicker and more powerful in its action, and not fouling the gun. For the delicate in the olfactory nerves, it may be added that it is without unpleasant smell. It has just been patented."

[The above has been going the rounds of the press, and we notice it for the purpose of stating that white powder is not new—it is old and well known. The same powder essentially was described on page 228, Vol. V. (old series) of the SCIENTIFIC AMERICAN, ten years ago; and from the recipe given for making it, Mr. John Caruthers, of Savannah, Ga., manufactured some, as described on page 261 of the same volume. At that time he sent us some samples of it, with which we made a few experiments. On one occasion, about two ounces of it exploded while his boy was mixing the separate ingredients in a mortar, as it is a powder which is explosive by percussion as well as by ignition. It is easily manufactured, but not suitable for firearms, as it corrodes steel and wrought iron rapidly. There is no necessity for using sulphur in the composition, as described above.—EDS.

IDENTITY OF PERSONS.—In a trial for murder, which recently took place at Cambridge, Mass., the counsel—B. F. Butler, Esq.—for Hacket, the accused, introduced a person as witness who counterfeited him so closely that it was difficult to tell wherein consisted the difference. When questioned whether he was in the street where the murder was committed on the night of its commission, this witness refused to answer on the ground that he might criminate himself. To a subsequent question he made the same reply, and Mr. Butler sustained his refusal, intimating that he had "put this witness in great peril to save an innocent party." The success of this ingenious expedient is such that several of the witnesses have concluded that this person is the guilty party,

THE POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported for the Scientific American.]

The usual weekly meeting of the Polytechnic Association was held, at its room in the Cooper Institute, this city, on Thursday evening, Dec. 20, 1860.

SEWING MACHINES.

Mr. WOOD replied to the statements of the last evening with reference to the shuttle stitch, and continued his remarks upon the sewing machine, exhibiting many specimens of work in illustration. The sewing machine, he said, has revolutionized 37 branches of manufacture. The saving to the country from the use of the sewing machine is very great. In New York alone $20,000,000 annually are saved upon men's and boy's clothing; upon shirt bosoms and trimmings nearly a million; upon boots and shoes in Massachusetts, seven and a half millions; upon shirts in the United States more than fourteen millions. The importance of this invention to the manufacturing interests of the United States is estimated at $342,000,000 annually. Not only is the coarser work done upon these machines driven by steam power, but there are large factories doing fine work upon machines driven by power. Mr. Wood here exhibited a board, representing the various

stitches, and also a diagram representing them, and also the effect in each of dropping a stitch. Mr. Howe had found that the ordinary hand stitches could not be made by machinery, and set to work to devise a stitch which could be made by machinery. No stitch had been tried which Mr. Howe had not experimented upon; but the only stitch which commended itself to his favor was the shuttle stitch. He might have tied a knot where the threads cross. The Wheeler & Wilson machine can very readily be arranged to tie a knot there, and the process has been patented. When the shuttle stitch is properly made, the seam is as elastic as any fabric that it is placed upon. It has been used for 14 years upon all kinds of work, from the heaviest harness to the lightest gossamer, and the seam has proved to be sufficiently elastic for all practical purposes. One peculiarity of this stitch is that it is drawn slightly below the surface of the cloth, so that it cannot be ironed off. Great stress has been laid upon the raveling qualities of some of the stitches. The shuttle stitch can be so made that it can be raveled out. It is only necessary to regulate the tension so that the lower thread shall not be drawn into the cloth. It can then be drawn out. This may be serviceable in making temporary seams, such as tucking dresses, which are afterwards to be let down. But that is not proper sewing, such as the machine is designed to make. The single thread stitch is as old as the hills—it is the old knitting or crotchet stitch. But it was never used for sewing until it was found that Mr. Howe had the monopoly of other stitches, and then the country was flooded with cheap machines, whose only recommendation was the low price at which the people were gulled. These machines made a stitch which would not only ravel, but rip; that is, the work could be pulled apart, leaving the stitches perfect. An important difference between the different stitches is shown in the result of dropping a stitch. With the machine in proper order, millions of stitches might be made without dropping one; but if it is out of order, a stitch may be dropped occasionally. If it is, the shuttle stitch is merely made of double length, but the chain stitch is left so that it may be raveled; so that it is necessary with the chain stitch to look over the work and tack down every place where a stitch is dropped. An objection to the Grover & Baker stitch is, that it forms a ridge upon the cloth which can be ironed off. With this stitch also, if a stitch is dropped, the work may be raveled from that point. The amount of thread used is so much greater that, in a single large factory, the difference may amount to $200 a day. For the clothing required in the United States there would be a difference of $40,000,000 in the article of thread alone. As to the elasticity of the stitch, if properly sewed, it is equal to the elasticity of the cloth; but the stitch may be sewed so as not to be so elastic. In the specimens of work which were exhibited the other evening, the stitches were made to break, as Pindar's razors were made to sell. In actual use, the seam is never exposed to the strain to which that work sewed on a bias was subjected. Again, if the stitch is so elastic one way it must be the other, so as to cause a gaping of the seam. For this reason, a great elasticity is an evil rather than an advantage.

Mr. Lansing exhibited models of all the stitches made either by machinery or by hand, showing their comparative value and the relationship of the thread to the cloth; hand backstitching being the best stitch made, either by machinery or by hand, for the reason that the thread surrounds the particles of cloth between each hole made by the needle, thereby getting its elasticity through compression or reduction. Hence the value of the Grover & Baker stitch, the relation of the thread to the cloth being the same as in hand backstitching. This does not apply to the shuttle or lock stitch. With the hand stitch the bearing is upon the cloth, but with the shuttle stitch it is upon the thread at the point where it is interlocked; and the finer and harder the thread, the more liable it is to cut itself off. Nine-tenths of the thread used being cotton or linen, which has little or no elasticity in itself, either the thread must be strong enough to hold the garment or the stitch must be such as to afford the elasticity required; and that elasticity in double thread machine sewing is only found in the Grover & Baker stitch.

The President inquired whether the ridge did not become important in heavy woolen work.

Mr. Lansing—Not at all. Upon heavy work it can be drawn into the goods; on linen or cotton work the ridge can be made so small that it will not wear or iron off. In the experience of four years with the Grover & Baker stitch, I have never known of its either wearing or being ironed off when properly made.

The President (interposing) inquired of Mrs. B——, (the lady present referred to by Mr. Wood) whether the stitch could be so constructed by a good seamstress as not to break.

Mrs. B——. The Wheeler & Wilson stitch? Yes, sir.

The President—If it is true that, with the several machines, a skillful hand managing the thread can make a seam that will not rip or break, it seems to me that that covers the whole ground.

Mr. Lansing—I think not. You can get operators to work well with almost any machine. But when you come down to the practical wants of the family, there are few who can do it. What the public want is a machine, simple, easy and natural in its operations, so that they cannot help making a good stitch. For that reason, the Grover & Baker stitch is superior to the shuttle stitch; it cannot go astray. But the tension can be purposely made so tight as to corrugate the work, and then, if it is upon a bias, it may be easily broken. With the shuttle stitch, the cloth must be sewed in a stretched condition, to gain that elasticity.

The President—Is it as true of hand work as of machine work that but few can do it well?

Mr. Lansing—Yes, sir; more than of machine work; for if the machine is in order, an ordinary hand can make good work; but good hand sewing requires years of experience. Mr. L. commented upon the amount of thread used, stating that the difference had been greatly over-estimated; for, in family work, no more thread was consumed with the Grover & Baker than with the Wheeler & Wilson machine, because the amount wasted in fastening off the work and from the ends made in rewinding with the latter, is equal to the excess used in the stitch of the former. The stitch being self-fastening, it is unnecessary either to fasten off the ends of the seams or to tack down stitches which may be dropped.

Mr. Wood resumed his remarks. The time required in rewinding the thread for the Wheeler & Wilson machine is but five minutes a day. The lower spool of the Grover & Baker machine must be replaced about as often as the bobbin of the Wheeler & Wilson must be filled; and replacing the lower spool, re-threading the lower crooked needle, would take as much time as filling the bobbin.

Mr. Garvey suggested that so far as the thread is stretched in the tension which imbeds it in the cloth its elasticity is reduced.

Mrs. B——(in reply to questions asked by the president) stated that she had used all three kinds of stitches; had worked upon sewing machines for five years, having used the lock stitch nearly three years and the Grover & Baker stitch for two years for all kinds of family sewing—upon cotton, silk, woolen, flannel, &c. She had not worked upon anything as heavy as beaver cloth, but had worked upon cloth heavier than that used for a gentleman's coat. With either the lock stitch or the Grover & Baker stitch, a well instructed person can do good work that will not break. There is a greater tendency in the Grover & Baker machine to drop stitches. It is almost impossible to run the machine more than one or two months without its dropping stitches; and then there is a tendency to ravel. The operator ought to notice it when it begins to drop stitches, but it is very difficult to get her to notice it. A girl with the Wheeler & Wilson machine can do more and better work in a day than with the Grover & Baker machine. Machine sewing is neater and stronger, and therefore preferred by customers to hand work. Hand work is not now done so well as it was before the introduction of the sewing machine, for there is less attention paid to it. All kinds of sewing for the family can be done by the machine, excepting putting on buttons and making button holes. Girls who had become so unhealthy that they were compelled to give up hand sewing had used the machine for several years without injury. The machine does not require so much stooping as hand work, and requires less application of the eyes. She had used the machine 18 hours out of the 24 without being so tired as in sewing five hours by hand. The time spent in threading the lower needle of the Grover & Baker machine, passing the thread through three or four loops, is much more than in winding the under thread upon the bobbin of the Wheeler & Wilson machine.

Dr. Gardner stated the result of extensive investigations he made for the last two or three years upon the influence of the sewing machine, in a hygienic point of view. In economy of work, the sewing machine is a great boon to mankind; but if, as some have thought, it kills one woman in ten, or maims one woman in five, or makes women sickly and feeble, it is a bad machine. Professional men have sometimes said that the working of the sewing machine produced rheumatism of the knees. This might be, if there was a predisposition to it; especially when the operator is beginning to learn, when she exerts strength enough to drive five or six sewing machines. One lady said it produced neuralgia; but upon covering the treadle so as to prevent the cold from affecting her feet, the neuralgia ceased. Others have asserted that it tends to produce or to aggravate the class of diseases known as female diseases. He had made extensive inquiries to ascertain whether this assertion had any foundation in fact. At one place he found that they had introduced compressed air to drive the machine. They were Singer machines, doing heavy work. They had found no bad effect from driving the machines without the aid of power; but the work was so hard that the girls had not the strength requisite to drive the machines fast enough to pay. To get up a paying speed it was necessary to introduce power. Yet, while these girls were driving these machines as fast as they could, no such diseases were produced. On the contrary, the universal testimony of the large manufacturers was that the working of the machines benefited the health of the operatives. To explain this, it is only necessary to consider the general physiological law, that use strengthens and the want of use enfeebles. Not only are the particular muscles in use strengthened by the exercise, but the adjacent muscles. Thus the blacksmith not only strengthens his arm by his labor, but his chest is enlarged; the pectoral muscles are strengthened. In one of these large establishments, employing 100 girls, the average daily absence from all causes was but three; so that it could not be that female diseases are ordinarily either caused or aggravated by the use of the sewing machine. On the contrary, he had come to the conclusion that it would be a valuable curative agent in many cases. In the European water cure establishments, the great remedies are air and exercise, walking up mountains and down declivities. And in Sweden, there is a new pathy, called the movement cure. He had no doubt that the prescription of a sewing machine would be better than that of a great many of the pills now given in many cases of debility. Another objection to the sewing machine was that it led to the injury to the retina called Amaurosis. There is this tendency in hand sewing, from the constant application of the eyes required, especially in fine, nice work; but upon the sewing machine the work is so mechanical, and the required action of the eye so general, that, unless there is a predisposition to Amaurosis, the use of the sewing machine would not cause that disease. He had consulted every distinguished oculist in the northern States, and the uniform reply corresponded to this conclusion. Nor is there, as is sometimes imagined, lint flying about in the use of the sewing machine to injure the eyes. After a prolonged examination of five or six months, he had come to the conclusion that the sewing machine was the greatest blessing to the community, in a mere hygienic point of view, that ever was given.

Mr. Young feared that women would be obliged to work as many hours in the day to earn the same amount of food and clothing with the sewing machine that they formerly did with the needle.

The President stated that it had been ascertained in England, by a census taken in a certain district embracing all classes of society, that the average length of woman's life is just in proportion to the amount she has to do; being the longest where no servant is kept, decreasing with those keeping one servant, and decreasing with each additional servant. On the contrary, the life of men is longest when belonging to the class of professional men, merchants, &c. The physicians, upon consultation, ascribed it to the fact that women do not take vigorous exercise in the open air, and that the work which compels them to use their hands and feet tends to supply the want.

The subject for next meeting will be the "Economy of Motive Power for Farms, Buildings, Small Manufactories and Sewing Machines."

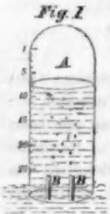
After the transaction of some private business, the society adjourned.

ELECTRICITY AND SOME OF ITS PRACTICAL APPLICATIONS.

ARTICLE II.

For measuring the quantity of electricity developed by the voltaic circle, an instrument was invented by Mr. Faraday; but before describing it, we shall allude briefly to the principle upon which its operation is based. When the electrodes are tipped with platinum, and immersed in dilute sulphuric acid, the water contained in it is decomposed into its elements—oxygen and hydrogen—and the quantity of these gases is always in direct proportion to the amount of electricity which has passed it. Upon this principle, an instrument called "the voltameter," is constructed. There are several forms of the voltameter, one of which is represented in the cut. A represents a glass jar containing the dilute acid, and inverted over a trough containing the same fluid. B B are the two platinum electrodes. The jar is usually graduated into cubic inches and tenths of an inch.

Fig. 1



If a certain battery gives off a definite amount of gas per minute in the voltameter, and another produces twice as much in the same period, then the second battery is twice as powerful as the first, as far as quantity is concerned. This instrument is not a good measurer of the intensity of the current. Professor Daniell found that a battery of ten alternations produced in a given time nearly as much of the gases as one consisting of seventy alternations of the same sized battery. This shows that the instrument should be used with certain precautions, and its indications should not be too implicitly relied upon; for, although it measures all the electricity which passes through it, yet a current might not have the power to decompose water very energetically, and yet be able to produce powerful magnetic effects. The surest way of ascertaining the power of any voltaic arrangement is by actual experiment with regard to the application which is to be made of it.

When a strong current, either of intensity or quantity, is caused to pass through a fine iron or platinum wire, the wire will be heated to a red heat, and sometimes will fuse. Advantage is taken of this fact in submarine blasting and in gas lighting, as well as in some delicate surgical operations. For producing this heating effect, if the circuit to be traversed is short, a current of quantity may be used; but if it is long and irregular, as in the lighting of a large building, a current of intensity is better.

The science of telegraphy, as far as it relates to inland lines and their working, has attained a degree of perfection; but the art of successfully operating the submarine telegraph—especially where it occurs in long lines—is, as yet, in its infancy. This was made painfully evident by the failure of the Atlantic Cable; and if American inventors do not deserve any of the discredit of its failure, they have not, as yet, brought forward a better cable.

The chief defect of the Atlantic Cable seems to have been the faulty insulation of the conducting core; and this defect appears to have been due to the selection of gutta-percha as the insulating material. This substance is a very good insulator while solid, but it softens and melts at a heat considerably below that of boiling water, and a number of miles of the cable were ruined by the heat of the sun while lying in the yard of the manufactory. Although gutta-percha is very plastic while warm, yet at common temperatures it is as inflexible and tough as the stiffest sole leather, although much more easily cut when spread over a hard surface.

To the other defects of gutta-percha must be added its comparative inelasticity, and, when broken, it snaps directly off, like so much hemp. What, then, must be the effect of a tensile strain which is greater than the strength of the gutta-percha, but not sufficient to rupture the outside covering of iron? Some portions of the cable, which have been taken up from deep water, have been found to have the wires of the outside covering drawn nearly straight; thus involving an enormous strain upon the gutta-percha interior, and, as much of the cable now laid must be in this condition, it is probable that defects exist all along the line. The Atlantic Cable, however, does not seem to work well even in shallow water, for two trials were made of it in one of our inland rivers—the Mississippi—and in both cases it stopped working in a few days from the time of its laying.

A plan has recently been patented by Mr. Hughes, in which the insulating material is to be of such a nature as to maintain a semi-fluid condition until it comes in contact with water, when it is to immediately become solid. A cable constructed upon this plan would fill all its own leaks—a great *desideratum* to be gained; but we are not yet aware that there is any substance which will answer that purpose.

The Effect of Steam Navigation on Commerce.

We are indebted to Messrs. Baileys, Davis & Co, Commission Merchants of Rio Janeiro, Brazil, for the following extract from a recent debate in the Chamber of Deputies of Brazil. Senor Franco de Almeida said:—

"That the Honorable Deputies may appreciate the immensely valuable interests which steam communication must create and increase, let it suffice to enumerate some of the principal products of which North America stands in need, and those which Brazil requires. We would furnish sugar, honey, drugs, fruits, coffee, cotton, tobacco, rice, hides, cocoa, sarsaparilla, precious woods, precious stones, dyestuffs, tapioca, cloves, isinglass, saffron, gum, copal, vanilla, copaiva, broom reed, (*piassava*), crude metals, &c., &c. North America could not find a nearer market than Brazil, nor could she procure these productions with greater facility or so cheaply; Rio de Janeiro would necessarily become a great American depot. On the other hand, we could supply ourselves with the productions of the United States with greater advantage and at a much cheaper rate. We would import wheat, flour, meats, butter, lard, horses, machinery, all articles of hardware, implements of trade and agriculture, furniture, woolen, and cotton cloths, sailing vessels, steamers, and furthermore, all the *imitative works of art*, which in the United States are extraordinarily cheap *compared with Europe*. To convince the minds of honorable deputies, I will remind them of a fact. The commerce of England with us from 1840 to 1850, was nearly always stationary, averaging £2,000,000 sterling, according to the Blue Book and McCulloch; during that same period our commerce with the United States was greater. And why? Because there was no steam communication then between the empire and Great Britain; the American clippers had an advantage over English barks; but the honorable deputies will remark that as soon as a line of English steamers was established, these wonderful results were produced. The importation from Brazil, into England in 1853, three years after the inauguration of the line, increased 150 per cent, over that of 1848. In 1855 it had increased 300 per cent; England, which in 1852 imported 3,000,000 pounds of coffee, imported in 1853, 52,000,000 pounds; in 1854, 59,000,000, and in 1855, 112,000,000."

A NEW DISCOVERY IN WINE MAKING.—A new discovery made by a wine grower near Bordeaux, France, has just been made public, and has somewhat startled the old and steady wine factors, makers, and doctors of that place. The discoverer of the natural phenomenon by which wines are rendered at once fit for bottling, without the long probation they have hitherto been made to undergo has been for some years living in the mountains. In the various qualities of wine grown by him he was struck with the difference of development of maturity which took place, according to the temperature of the cellar in which the barrels were stored. The higher up the mountain the sooner did the wine arrive at perfection. The reason of this difference soon became clear—atmospheric pressure diminishes gradually as the region rises above the level of the sea. This discovery induced the experiment of raising and diminishing at will the atmospheric pressure upon the barrels and with the most perfect success, it is said, so as to make old wine in as many days as it formerly took months.

DEATH OF AN EDITOR.—We learn that Mr. Alexander Mann, formerly editor of the Rochester (N. Y.) *American*, afterwards of the Albany *Statesman*, and subsequently engaged on the New York *Times*, and first editor of the *Railway Review*, died suddenly of apoplexy, on the 6th ult., at St. Augustine, Florida, to which place he had removed on account of his health, and had intended to make it his future home. He was an able political writer, and his geniality of disposition and integrity gained him a host of warm friends.

Coating Iron with Zinc.

By Mallett's English process, iron is coated with zinc as follows:—First immerse the iron to be coated in a cleansing bath formed of equal parts of hydrochloric and sulphuric acids in warm water. The taste of this bath should be quite sour—about a pint of acid to five gallons of water is sufficient. The metal is scrubbed with sand and emery, to remove the oxyd and render the surface perfectly clean. It is then washed in soft water and immersed in the preparing bath, which is made of a saturated solution of hydrochlorate of zinc and sulphate of ammonia, from which it is transferred to the metallic bath. This is composed of 202 parts, by weight, of mercury and 1,292 parts of zinc, and to every tun weight of this amalgam one pound of sodium is added. Any less quantity than a tun may be melted, according to the amount of work to be done. This amalgam is melted in a cast iron vessel, and the prepared metal is dipped into it. As soon as the iron has attained a temperature of 680° Fah. in this bath it is removed, because if it is continued longer it will be eaten into holes. Great watchfulness must be exercised in dipping the iron, so as not to allow of its being dissolved, as the affinity of the amalgam for the iron at 680° is very great.

Small articles of iron may be galvanized without the aid of quicksilver, by cleansing them well as described, dipping them in a strong solution of salammoniac, then transferring them at once to a bath of molten zinc containing some pieces of salammoniac and some ground glass placed upon the surface. By this method of zincing iron its surface is liable to be rough, but by running it between rollers or hammering it on a planishing anvil, it can be made quite smooth. By using a bath of hydrochloride of tin (tin dissolved in muriatic acid), as a substitute for the preparatory bath of salammoniac, a rather superior coat of zinc will be obtained.

OINTMENT FOR THE SKIN.—That able writer, Dr. Erasmus Wilson, on cutaneous diseases, says:—"The benzoated oxyd of zinc ointment, properly prepared, is the most perfect local application for all chronic inflammations of the skin that is known. It is cleanly and agreeable, and has a tendency to concrete upon the skin and form an artificial cuticle to an irritated and broken surface." This ointment is made by selecting the best and most fragrant gum benzoin in tears; this, when comminuted, is added to good fresh lard, in the proportion of ten grains to the ounce, and the whole digested in a water bath for about forty-eight hours; this, subsequently strained, is mixed thoroughly with ten grains of the white oxyd of zinc. Gum benjamin is now very generally used in ointments by London apothecaries for preventing their decomposition; ten grains added to an ounce of lard effect this object. It has an agreeable odor and may be used as a substitute for gum benzoin.

DYEING MOTHER-OF-PEARL.—Black mother-of-pearl, which is so much used for buttons, may be dyed from the white material in the following manner:—When the mother-of-pearl is cut out into buttons, they are steeped for twelve hours in a strong solution of nitrate of silver, contained in a glass vessel of a blue color to prevent decomposition by the light. They are then allowed to drain, and washed several times in distilled water, after which they are placed in chloride of sodium, in which they remain for an hour and a half. They are then washed in rain water, drained and washed over with a very weak solution of nitrate of silver, and exposed to the rays of the sun for several hours. Ammoniacal solutions of chloride of silver and of nitrate of silver may also be used for the purpose of dyeing this substance black; but the effects of these salts are less satisfactory.

CLARIFIED GALL.—The *Druggist*, published in Cincinnati, contains the following recipe:—"Ox gall is prepared for the use of artists in the following manner: To one pint of fresh ox gall, boiled and skimmed, add one ounce of finely powdered alum; leave it on the fire till the alum is dissolved, then let it cool, put it into a bottle, and cork it loosely. Treat another pint in the same way, with one ounce of salt, instead of alum. After standing more than three months, carefully decant from each bottle the clear portion, and mix them together. The coloring matter is precipitated, and a clear, colorless liquid is obtained by filtration. It is used for mixing artists' colors, and to prepare ivory, oiled paper, &c., to receive the colors."

ROMANCE OF THE STEAM ENGINE.

Article V.

HAUTEFEUILLE.

In the middle of the seventeenth century, Jean Hautefeuille, the son of a baker in Orleans, France, gave great indications of mechanical genius, when a boy, and the Duchess de Bouillon, having heard of this, sent for and took him into her family, where he became a great favorite and received an excellent education. He became one of the most celebrated mechanics of that age, although he had adopted the Church as his regular profession. In 1678, he propounded several novel applications of heat as a moving power, and suggested the employment of the vapor of alcohol instead of water. He proposed that it should be evaporated and act as the motive agent, then be condensed in a close vessel and used over and over again for the same purpose. He also proposed ignited charges of gunpowder for the purpose of moving machinery, as a substitute for steam. He also described how a motive engine could be constructed to operate a piston by using the vapor of water and a vacuum alternately in a cylinder. The alcohol engine was similar in its nature to the ether engine lately in use in France, and the gunpowder engine has been frequently proposed in our own day.

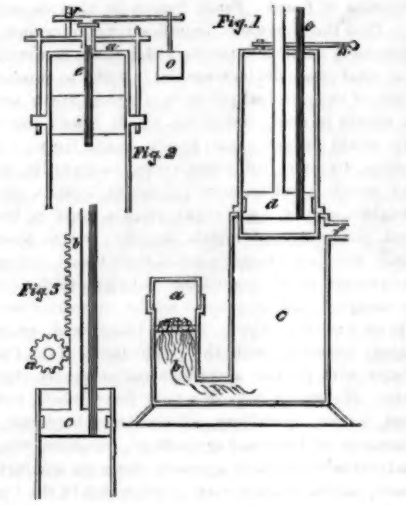
PAPIN—THE SAFETY VALVE.

One of the most ingenious mechanics that ever lived was Dr. Denys Papin, of France. He discovered the mode of reducing bones to a pulp by inclosing them in a tight vessel and submitting them to the action of high pressure steam. He came from Paris to London and published an account of his invention in 1781. The pumping of the water from the mines in England being then a subject of unusual interest, he proposed to operate the pumps by compressed air, and to convey it from a considerable distance for this purpose. For example, where there was a mine distant about a mile from a water wheel, he proposed that two cylinders containing pistons should be placed at the wheel, and two other cylinders at the mine—the whole to be connected by a pipe. The pistons at the wheel were to force compressed air to work the pistons at the mine, and these were to operate the lifting pumps and draw up the water. This plan was correct in theory, but when tried it failed of success. Although the reason of the failure is not given, we believe it was caused through defective and leaky pipes. For several years a compressed air engine has been in use in a coal mine near Glasgow, Scotland, and although the air is forced through a pipe one mile long, no difficulty has been experienced in working it.

Papin did not receive the patronage due to his genius in England, and he was worse treated in France, his native land, for, being a protestant, he was exiled by the revocation of the edict of Nantes, when he afterwards went to Marpurg, in Germany. When residing there, he applied his compressed air machinery to drain a mine, but it also failed, as it had done in England; then he tried the converse system, by exhausting the tube, but this failed also; and we are confident that it must have been through leaks in the pipes. Papin was about two centuries ahead of his age in the employment of compressed and exhaust air machinery. Both of his plans have been used with more or less success for railways, within the past twenty years; and the employment of compressed air to drive railroad cars and sewing machines is frequently discussed with great plausibility, as feasible methods, at the present day.

Papin also proposed the hot air and vapor engine illustrated by the accompanying Fig. 1, for pumping mines; *c* is a cylinder, in which there is a tightly-fitting piston, *d*, with a packing ring on it; *a* is a grate with a fire on it, and *b* shows how the heat passes into the cylinder, having a small draft pipe, *f*. The stem of the piston goes through the cover of the cylinder; *n* is a lever turning on a hinge, and is fastened on the top; a spring acts to press it into a notch in the piston rod, when it comes above the cover. A small pipe, *e*, inserted through the cover of the cylinder and also through the piston, is firmly closed at the upper end. The stopper of the pipe being taken out, the piston is easily moved to the bottom, when a small quantity of water is passed down under the piston and the pipe is closed. The heat from the fire soon converts the water into vapor and the piston is forced up to the top, where it is held by the notch of the lever. The fire was then withdrawn, the cylinder cooled, and a vacuum was produced under the piston which then descended by the pressure of the atmosphere. The lever, *n*, was then withdrawn from the notch, to permit it to descend. Fig. 3 shows how a vibratory motion may be given by the up-and-down movement of the piston, *e*, through the rack, *b*, on the piston rod and the pinion, *a*. This steam and vacuum engine is undoubtedly impracticable, but it is certainly very similar to hot air engines in the mode of generating the vapor by admitting a single charge of water for every stroke. There is no danger of explosions by this method.

The crowning feat of Denys Papin was his invention of the safety valve illustrated by Fig. 2. A small



tube, *e*, is fitted into an opening, *a*, in the cover of a boiler, and in this is placed a valve ground to exactly suit the orifice. A rod is put into an iron staple, *r*, at one end; its other end is kept down by the weight, *o*, which is hung nearer to or further from the valve, to resist the pressure within, as may be desired, "in the same manner," said Papin, "as a weight is hung upon the Roman balance or steelyard." This invention is employed upon every steam boiler at the present day. It was devised for Papin's bone "digester," but no boiler whatever would be safe without it.

THE MAGNESIUM LIGHT—A NEW FIELD FOR INVENTION.

Not many months since, Chevalier Bunsen drew public attention to the researches which he had made with magnesium as a source of light. This metal readily takes fire in the flame of a common spirit lamp, and gives out a most brilliant light. Compared with an ordinary candle, a wire of magnesium, only 0.0117 of an inch in diameter, produced as much light, according to Bunsen, as 74 sperm candles, at the rate of five to the pound. In order to support this light for one minute, a piece of wire 39 inches long, weighing 1.85 grains, was required. About 2¼ ounces of magnesium, therefore, would be required in order to maintain a light for ten hours equal to 74 stearine candles, consuming 320 ounces of stearine. Magnesium wire is made by forcing the metal through a hot steel die, by means of a steel piston. Bunsen's arrangement for burning the wire was made by connecting spools of it with rollers moved by clockwork, so that the wire should be unrolled like the ribbon of paper in Morse's telegraph; the end of the wire thus gradually pushed forward passed into the flame of an ordinary alcohol lamp, where it took fire. It is evident that a magnesian lamp of this sort must be more simple than any of the existing arrangements of the electrical or of Drummond's light, for lighthouses, &c. Where an extraordinary amount of light is needed it could readily be produced by burning large wires, or several thin ones at the same time.

The photographical effect of the magnesian light is said to be unrivalled by any other artificial flame, and with it photographic artists may be able to take pictures by night nearly as well as by daylight. The present high price of the metal magnesium, however, precludes its use for common purposes, but could it be obtained at a moderate cost, miniature suns might be used for illumination in every house with common spirit lamps and a winding off arrangement of the wire, which would cost but a few shillings. Here is a new field for chemical experiment; magnesian formations are numerous in America, and economical processes may be discovered for the reduction of the metal from its ores. A few years since, the metal aluminum was almost unknown, and its price was higher than that of gold, but now it has become comparatively cheap, owing to the improvements which have been made in the chemical processes for treating aluminous earths. It will undoubtedly be the same with magnesium, and in a few years, and perhaps months, we should not be surprised if the magnesian light would take the place of gas, coal oil, sperm candles, or any of the illuminating materials used in our houses.

Sanitary Science.

In New York there is a "Sanitary Association," but although its objects are benevolent and deserve the support of all classes, we believe it has as yet been unable to effect much good. A meeting of its members was held at the Home for the Friendless on the evening of the 27th ult., at which a resolution was passed recommending the formation of a female sanitary missionary association for the city. On the occasion, several speeches were made. Dr. Harris spoke particularly of the importance of a public knowledge of the practical science of ventilation, light, economy and correctness in the formation of personal habits. The Rev. H. W. Bellows stated that there was great difficulty in gaining popular attention to sanitary reform, as it was a question involving many details. There was an unwillingness on the part of those who considered themselves very charitable persons, to stoop to the real work which charity requires. Hygiene is almost as little understood by the higher as by the lower classes. Rooms were not well ventilated and ladies' clothing was not worn in accordance with the laws of health. James T. Brady, Esq., spoke of the defective styles of public houses. He stated that there were no cities in Europe where the places of refreshment were kept under ground, as in American cities. Several speakers, such as Dr. Muhlenberg and Dr. Griscom, gave it as their deliberate opinion that most of the degradation of the lower classes was directly traceable to evil habits, such as the drinking of ardent spirits and the chewing of tobacco.

Edwin Chadwick, Esq., of London, recently delivered an address on this subject, in which he stated that in several districts known to him, by a proper drainage within the houses and the use of water led into them by pipes, the death rate had been reduced one-third annually. He said "I know one instance, in an agricultural district, and with laborers alone, where the death rate has been reduced to less than one-half, and within twelve in a thousand. From common lodging-houses, the enforcement, through the police, of sanitary regulations, typhus and diarrhea, as epidemics (whilst prevalent among the houses of the laboring classes), are banished. In our well-regulated district institutions for pauper children, those epidemic visitations which ravage the children of the families of working men, are almost unknown, and the death rate is reduced to one-third that prevailing amongst their children. The death rate among British soldiers used to be 17.5 per 1,000 annually; now, by sanitary reforms, it is reduced to 4.7 per 1,000."

The city of Liverpool, in England, used to be one of the most sickly in the world, but owing to the scientific sanitary measures which have been carried out in it during the last few years it has become one of the most healthy. During the past ten years there has been a reduction of 30 per cent in the mortality bills. This, certainly, is a very important subject, and yet it is very difficult to excite the public mind to give it proper attention.

Steam Fire Engine.—The Portland Co. in Portland, Maine, are now building five steam fire engines, of J. B. Johnson's patent, viz: one of the largest class for Portland, two of the third-class for New York, and one second-class for Philadelphia. The third-class are light engines weighing only 3,100 pounds, and having very large wheels are drawn by hand more rapidly than a first-class car "hand tub." The engine built for the United States Co., Philadelphia, third-class, has played at one fire no less than five hours consecutively without stopping.

Our Correspondence.

Reply of Professor Silliman to Mr. Jos. W. Sprague's Inquiry, "What is Momentum?"

MESSRS. EDITORS:—In the issue of your journal for Dec. 15, 1860, Mr. Sprague has propounded an inquiry under the above head, and has seen fit to employ a section from the first edition of my "Natural Philosophy" to show that the definition of *Momentum* there given is "wrong! all wrong, from beginning to end." As Mr. Sprague proposes to follow up the subject in your issue of this week, I have waited for his concluding article; but, as it has not appeared, I have to request you to publish my reply to this writer's confident denunciation.

Some confusion doubtless exists, even in high authorities, in the distinctions to be observed between *momentum* and *vis viva*. I think, however, there is no reason why this subject should not be made plain; and as it is one in which all mechanics feel an interest, you will perhaps confer a favor on your readers by publishing the following paragraphs from the second edition of my "Natural Philosophy."

Momentum.—The momentum of a moving body is its amount of motion, or its tendency to continue in motion. The momentum of a body is equal to its mass multiplied by its velocity. When a force acts upon a body free to move, it produces its effect as soon as motion is diffused among all the molecules, and the force is then transferred into the substance of the moving body. In consequence of the inertia of matter, if the moving body should meet no resistance, it would continue to move with the same velocity, and in the same direction, forever.

The expression Mv represents the intensity of the force which has set the body in motion, and MV represents the amount of force that is at any time accumulated and retained by the inertia of the moving body. In either case, the moving body is supposed to encounter no resistance from any other object.*

When a moving body encounters resistance, depending not only upon inertia, but also upon other properties of matter, the effects produced depend upon the rapidity with which the force, expressed by momentum, is brought to act upon the opposing body. This class of effects are, therefore, proportioned to momentum multiplied by velocity. This product MV^2 is called *vis viva*, the application of which, to practical mechanics, will be explained hereafter. By the principle that action and reaction are equal, we know that when a musket is discharged the force of the explosion reacts upon the musket with the same intensity as it projects the ball. According to the principles of momentum, the weight of the gun, multiplied by the velocity of the recoil, must be equal to the weight of the ball, multiplied by the velocity of its projection; yet the recoil of the gun is received by the sportsman with perfect impunity, while the moving ball deals death or destruction to opposing objects.

Vis Viva, or Living Force, is the power of a moving body to overcome resistance, or the measure of work which can be performed before the body is brought to a state of rest. The *vis viva* of a body is represented by MV^2, or the mass of the body multiplied by the square of its velocity.

When a body is projected vertically upward, the hight to which it will ascend is proportional to the square of its velocity. If W represent the weight of the body, and h the hight to which it is elevated by a given impulse, the amount of work performed will be represented by Wh, but $W=Mg$ and $h=V^2\div 2g$, substituting these values of W and h, we have the work performed$=\frac{1}{2}MV^2$. Hence, the work which can be performed by the accumulated power of a moving body is equal to one-half the mass multiplied by the velocity.†

Take the case of a pile-driver, in which a heavy mass of iron is elevated to a hight of 30 or 40 feet, and is then suddenly allowed to fall; the resistance overcome in raising the driver is exactly proportional to the elevation to which it is raised, and the accumulated power of the stroke increases in the same ratio: hence it is evident that the *vis viva*, or power of overcoming resistance, must be truly represented by MV^2.

Again: in the case of a railway train moving with a velocity V, the greatest velocity attainable by a given power of steam; let v be the acceleration of velocity imparted to the train by the locomotive during the first second of its action, and M the mass of the moving train, including the locomotive. If the movement of the train were not retarded by friction, or some other opposing force, we should have $V=vt$, or the velocity, V, would go on constantly increasing; but such we know is not the case, for the train soon attains a maximum velocity, when the entire force of the locomotive is every instant expended in overcoming friction, and the train moves on with a momentum expressed by MV, but its *vis viva* is expressed by MV^2.‡ If the force of steam were suddenly discontinued, the power of the moving train to ascend a grade, to overcome any obstacle, or to deal destruction to itself, or to any object with which it comes in collision, would still be proportional to *vis viva* or MV^2. Now, suppose the velocity of the train to be doubled, so that $V=2V$. It is evident that in any given interval of time the train will pass over twice as many points of resistance as before, and, as it passes each point at twice the previous velocity, it will encounter at every point twice as much resistance to motion as before. Hence, to impart to the train a double velocity, a fourfold force is required; and the power of the train to overcome resistance will be proportional to its *vis viva*, MV^2. This will be the true measure of the force which has imparted the velocity V, and which is now constantly expended in overcoming the resistance encountered by the moving train. The same principles determine the power expended or work actually performed, resistance included, by any kind of machinery.

It may be necessary to explain more fully the distinction between *momentum* and *vis viva*, so that it may be readily understood when the one or the other is to be taken as the measure of force.

Momentum, MV, expresses the relation of force to inertia, or the amount of motion in a moving body. *Vis viva*, MV^2, is the measure of twice the amount of work which a moving body can perform before it is brought to rest. *Vis viva* is the measure of force required to maintain a constant motion, MV, against the resistance caused by the positive properties of bodies, as attraction, cohesion and repulsion. Momentum is the measure of the force required, without regard to time, to set a body in motion with a velocity, V, when no other body interferes with its motion, as in the case of a body falling freely in a vacuum. In the case of the railway train, the mass of the train, multiplied by its velocity, is the measure of *useful* work performed in a unit of time, but it is not the measure of resistance overcome, or *actual* work performed, or of the force which has been expended in performing that work. The latter is measured by one-half the *vis viva*, or $\frac{1}{2}MV^2$.

Illustrations of Vis Viva.—Suppose a battering ram, weighing 4,000 lbs., to be impelled with a velocity of 30 feet per second, its *vis viva*, $MV^2=4{,}000\times 30\times 30=3{,}600{,}000$; yet a cannon ball weighing 64 lbs., flying with a velocity of 1,000 feet per second, will have a power of dealing destruction more than seventeen times as great, for its *vis viva* equals 64,000,000 lbs. Calculations of this sort explain the origin of the terribly destructive power of the engines of modern warfare.

A railway train moving 50 miles an hour will possess more than six times the *vis viva* that it would have when going 20 miles an hour; and, therefore, it will possess more than six times the power of dealing destruction, either to itself or to an obstacle, at the former than at the latter rate. Thus, the well-known relation between speed and amount of damage, in case of accident, is readily accounted for, as also the enormous comparative cost of fuel and wear and tear of trains of high speed.

The destructive power of hurricanes, which move from 60 to 100 miles an hour, is readily understood when we know that the power of dealing destruction increases in proportion to the square of the velocity.

I might add further illustrations on this subject, but I feel confident that a careful study of these extracts will satisfy all who will take the trouble to examine the subject, that there is more in it than Mr. Sprague has yet clearly comprehended, and that it will require more than his triumphant denial to disprove it. I am, however, much obliged to Mr. Sprague for affording me this introduction to your readers, and remain, respectfully yours,

B. SILLIMAN, JR.

New Haven, Dec. 21, 1860.

* In this discussion, M represents the mass of the moving body; v represents the increase of velocity acquired in a unit or time, and V represents the velocity acquired at any period of time considered.

† g represents the velocity acquired by a body falling freely during the interval of one second.

‡ t represents the time required to acquire a velocity, V.

Telegraph Magnets.

MESSRS. EDITORS.—On page 264, Vol. III, (new series) of your most valuable paper, I find a cut and description of an "Improvement in Electro-magnets." For telegraphing, I must say I do not think it will be an advantage. What is needed for telegraphing is a steady current, but that is very rarely—in fact, never—obtained on long circuits. The current is at times very strong, and will frequently change in an instant and the power of the magnet be diminished, perhaps one-half, frequently more. That is a great source of trouble to operators, for when the current is increased or decreased, the counteracting tension on the armature of the relay must be correspondingly increased or decreased, or the writing will be indistinct, if it is heard at all. Now the table referred to says:—

Battery power.	Power from steel magnet.	Power from both combined.	Excess of combined power over both separate.
5	20	30	05

again:—

24	20	62	18

which you can easily see would be increasing the difficulty now experienced.

If some one would invent an apparatus that would counteract the effects of a changeable current, it would be a real benefit and one that would be appreciated by all operators.

Having had some experience as an operator, I, of course, give you my own practical experience. I do not wish to disparage the inventor, but my object in writing is to suggest to him or some other ingenious person the idea of getting up an instrument that would obviate the difficulty I have spoken of. I have thought and experimented much on it, but as yet I am unsuccessful. But I do not despair of success.

As a case in point, I am writing in a telegraph office on the New York and Buffalo route. Before me is a relay magnet (not connected with the local circuit) connected with the through wire from Buffalo to New York—it is, say, fifty miles from the Buffalo battery—on which those two offices work direct without the aid of a repeater. Just now I hear Buffalo calling New York; it sounds loud and distinct—quite loud enough to do business by. Now New York answers; it is very faint—the power of the magnet is very much diminished. I may be wrong in my explanation as to the cause of the diminished power of the magnet, but I can think of no other cause, as the current from the Buffalo battery has to meet the current from the New York battery at the New York key, making it charge the four hundred miles of wire with very little assistance from the New York battery. So much so that I have to get very near the relay to hear it, and then it is imperfect and indistinct; and to get it perfectly I must lessen the tension on the armature, or else the writing cannot be relied upon, as some of the dots would be lost. You see the disadvantage labored under now, and with the addition of a permanent magnet, acting as the table above referred to shows, the disadvantage would be very much increased.

One thing more which may cover the whole ground. Permanent magnetism has been proved to be anything but an advantage to a relay magnet. A relay pretty strongly charged with permanent magnetism—they all are somewhat if in use—*will not work with a very weak current*, and we cannot always have a strong one, on account of atmospheric electricity, which, in certain states of the atmosphere, neutralizes the electricity of our batteries. I have frequently been very much annoyed by permanent magnetism, making it impossible to "adjust;" to get rid of it we must reverse the current through the coils.

W. J. R.

Lockport, N. Y., Jan. 2, 1861.

NOVEL SCREW PROPELLER.—A small steamer of novel construction has lately been plying on the Serpentine, London. It is on the principle of the double canoe. This twin-boat is, in fact, raised out of the water and supported upon two pontoons of a cylindrical form of two feet in diameter, and 18 feet long. These pontoons of tubes are each fitted with a solid conical spiral screw at the stem, driven by a direct center shaft worked in the usual manner. The propellers are made to act together, or in opposite directions, in such a way that the vessel is driven by one or both, and may be turned in a sweep of little more than her own length. This boat was built in Bristol, and in its passage to London it towed two barges laden with 90 tuns of stone in shallow water at the rate of three miles an hour, with 20 lb. steam pressure in the boiler. It is only three tuns burden.

Practical Directions to Engineers.

We continue our extracts from King's work on the Steam Engine, published by F. A. Brady, No. 24 Ann-street, New York:—

SWEEPING FLUES.

One of the most disagreeable parts of the duties is that of cleaning flues; from the fact of its dirtying everything round about or in the vicinity of the boilers, the slightest draft being sufficient to waft the light dry ashes in every direction. A little water sprinkled on them before they are hauled out of the connections or smoke-boxes will prevent this in a measure, the damper and ash-pit and furnace doors being closed, to prevent the men from being suffocated who go inside. The lower flues, particularly, are apt to leak a little, and the salt water, mixing with the ashes, forms a solid mass, which can only be removed by being cut out, the flue brush being of no avail. The hammer and chisel, and long, sharp-pointed bars, and sledge, are best adapted to the purpose. In the use of these instruments, care should be taken that they be not driven through the metal or under the seams.

ASH PITS.

The ash pits should be cleaned out every watch, and the ashes thrown overboard, picking out first any lumps of coal that may have fallen among the ashes. When not running at full speed, a portion of the cinders may be thrown upon the fires again, after dampping them with a little water. So also should fine bituminous coal be dampened before being supplied to the furnaces, the arguments to the contrary notwithstanding; for though it does take a little heat from the fire to evaporate the water mixed with the coal, a saving is effected, by preventing the coal from being drawn—particularly in boilers with strong draft—through the flues and lodged in the connections, or out of the smoke-pipe. No more water, however, should be put on the coal than just sufficient to dampen it.

SMOKE-PIPE STAYS.

Require to be looked to occasionally, when made of rope, as they grow a little slack from time to time. These should always be adjusted while the pipe is hot; otherwise, if they be set up while the pipe is cool, the expansion after it becomes heated will, in all probability, "carry" either the stays themselves away, or the band securing them to the pipe. In a gale of wind, when the ship is rolling heavily, these stays should be looked to, in order to tighten any of them that may have become slack, so as to throw the strain alike on all. Hemp rope is a very inferior article for such purpose as stays for smoke pipes, and we can see no good reason, unless it be prejudice, (which is always a good reason to those under such influence,) why it has been so long retained. Good wire rope looks better, is cheaper, and will last a great deal longer, and requires much less attention.

GRATE BARS, &c.

When fitted new, are usually allowed plenty of play, both fore and aft and sideways, to allow for expansion after they become heated. The spaces at the end of the bars, however, become choked up with ashes, which become, by and by, so hard as to form almost a solid mass, defeating the objects for which they were left. These spaces, therefore, in port should be cleaned out occasionally.

Ash pits, in port, should also be well cleaned and painted, to prevent oxydation. At sea, no water should be thrown into them upon the ashes, but they should be kept as dry as possible. With these precautions, they will last as long as other parts of the boiler. Boilers unused for any considerable time should be kept dry of water, and have fires made occasionally in the ash pits, to evaporate all interior deposit of dampness—the neglect of this precaution is the sole cause of the oxydation and deterioration of all boilers when not in use.

BROKEN AIR-PUMP.

Should the air-pump become broken in an irreparable manner, and the engine be a single one, there is but one thing that can be done, and that is to work non-condensing. If there be two engines, we have three resorts: to work the broken engine non-condensing, to disconnect from the crank pin and proceed with one engine, or, if there be facilities on board, to join the exhaust of both engines with a pipe, and use one air-pump and one condenser for both engines. This latter plan was tried very successfully for a short run on board the U. S. Steam Frigate *Powhatan*, on the China station, in the summer of 1855. Peculiar facilities were, however, offered in this case, as the exhaust side pipe of each engine had a man-hole in it, to which the connecting pipe was joined.

In running under such circumstances, care should be taken not to overload the air-pump.

BROKEN CYLINDER HEAD.

Water may be worked over into the cylinder suddenly, from boilers foaming badly, or otherwise, faster than it can escape through the water valves, and being nearly non-compressible, something must give way, the cylinder head or bottom being the most likely thing to go. In such an event, if there be a spare one on board, put it on; if not, while the old one is being repaired, if it be reparable, the following plan can be resorted to: Disconnect the steam and exhaust valves from the damaged end of the cylinder, if the engine be fitted with poppet valves, and let the atmospheric pressure force the piston in one direction, the steam being used for the opposite direction. Should the engine be fitted with a slide valve, close up the opening into the damaged end of the cylinder by fitting in, steam-tight and in a substantial manner, a block of soft wood. This should not however, be resorted to, except in cases of great emergency. Cylinder heads should have man-hole plates of less strength than the heads; this would prevent the destruction of heads in all cases.

THE SELECTION OF COAL.

The kinds and qualities of coals are so varied that no general rules can be given for their selection, but there is one point, however, which we think will not be disputed, and that one is, whenever there is a choice, the only sure plan is to select the best; for, though its first cost may be a little more, it will prove to be the cheapest in the end. What economy is there in purchasing one coal because it can be obtained 10 or 15 per cent cheaper than another, when there will be burned, to produce the same effect, from 20 to 25 per cent more than would be burned by the better kind? Yet this is a thing of daily occurrence. But, regardless of the money view, there are other disadvantages attending the use of the inferior coal. From the fact of there being more burned, the firemen have more to supply to the furnaces, and it requires, on their part, greater care and attention to keep the fires in good order; thus imposing extra duty on a portion of the ship's crew whose energies are usually overtaxed. Besides, to convey the vessel a given distance, an extra quantity has to be taken on board, which, in the case of merchant ships, diminishes their freight capacity, or, in war ships, lumbers the deck with a useless number of bags.

Some boilers are best adapted to bituminous coals, others to anthracite, and the one or the other of these coals which should be selected, depends upon the circumstances, therefore, for which they are intended.

In the selection of coals, it is an object to obtain those free as possible from earthy impurities. Slate, and such like matter, is to be avoided. Sulphur in bituminous coals makes them the more liable to spontaneous combustion. So also receiving them on board wet will endanger spontaneous ignition. Coals which have been exposed a long while to the rays of the sun, particularly in tropical climates, undergo a gradual decay, reducing their evaporative qualities.

SAFETY VALVE.

Steam, when once commencing to blow off, will not cease when the pressure has fallen to the pressure due to that for which the safety valve is loaded, but will continue to blow off until the pressure has fallen some pounds below this. This is owing to the increased area which the steam has to act upon when the valve is open over what it has when the valve is closed, occasioned by the bevel of the valve face. In a heavy sea, the safety valve may be forced open for a short time, even when the pressure is below that for which the valve is loaded, by the oscillation of the ship.

WATER ON STOCK FARMS.—Mr. Strawn, the great Illinois farmer, gives the following method in the *Farmer's Advocate* for keeping water on a stock farm: Dig a basin five or ten rods square and ten feet deep, upon a high knoll. Feed corn in the basin to your hogs and cattle until it is well puddled by the tramping of their feet, which will make it almost water-tight. He says the rains of a single winter sufficed to accommodate several hundred head of cattle, and that it had been dry but once in twelve years.

Column of Varieties.

Professor Boettger states that gun cotton is a most excellent filtering medium for chemicals. A small tuft of it placed loosely into the throat of a funnel answers for both alkalies and acids.

The exudation of gum from certain trees, such as the plum, peach, cherry, almond, &c., is the result of disease arising from various causes, all of which have the effect of accumulating the sap at one point. It arises from excessive nutrition of new tissues. The transparent gums which we obtain from trees may be truly called the "tears of the vegetable world."

It would appear, from numerous observations, that soldiers are hit during battle according to the color of their dress, in the following order: Red is the most fatal color; the least fatal, Austrian gray. The proportions are—red, 12; rifle-green, 7; brown, 6; Austrian bluish-gray, 5.

Respecting the metal trade of England, the London *Engineer* says:—"There was a diminished exportation of tin plates to India and the United States during the last nine months, but the exports to all other markets have increased."

Sunderland, England, used to be the headquarters for building timber ships; now most of the shipbuilders are engaged in constructing iron vessels, and great preparations are now making by them all for extending this business. There are 1,700 workmen engaged at present in building iron ships in this place.

There have been some exciting scenes at the meetings of the Academy of Sciences, in Paris, lately. M. Leverrier and M. Delauny have had some tremendous pitched encounters about different modes of calculating planetary movements. All Paris has been on tiptoe to hear the scientific combatants, and the meetings have been crammed.

At Attleborough, Mass., large quantities of the best qualities of brass and gilt buttons are manufactured by Evans & Co. Their factory has been in operation for thirty years, and several hundred styles of buttons are made on the premises. Most of these buttons are now used for military uniforms, boys' jackets, &c.

A trial was recently made at Lyons, France, of a new species of locomotive, in which steam is replaced by ether. The engineer imprudently continued smoking his cigar while getting the engine ready; a spark from the cigar fell into the chamber which contained the ether, on which the latter became instantaneously a mass of flame. The engineer was seriously injured, and the trial was necessarily postponed.

Some of the grand people of Paris have had their gardens roofed over with glass, and converted, with the aid of hot air and extensive importations of flowers, into "the most charming of winter paradises," where they receive their visitors and give elegant little *fêtes champêtres*, to the great admiration of those who are invited and the equally great despair of those who are not.

The boring of artesian wells seems to have been carried out with great success in the province of Constantine, in Algeria; 50 wells have been opened since 1856, which yield, altogether, about 13,000,000 gallons in the course of 24 hours. These borings have been executed with three sets of boring apparatus only, at an expense, exclusive of the cost of the apparatus, of about £110 for each of the 50 wells.

In France, the Acclimation Society offers a medal worth $200 for the complete domestication of the kiang—a valuable beast of burden, of great swiftness, which belongs to Thibet. The same medal for the domestication of a large species of the kangaroo—but whether to be ridden, driven or eaten, it does not say; six specimens are to be produced, and of the second generation, bred by the winner, $400 is offered for the introduction and domestication of the African ostrich, and the Australian emu, to be hatched in the same way as barnyard fowls, and of the second generation.

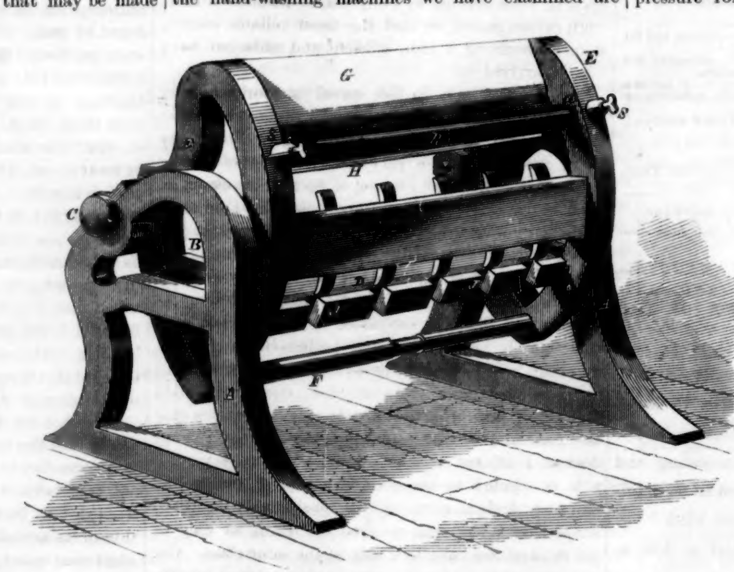
A patent has lately been taken out by C. Couper, of London, for a new and beautiful blue color. It consists of soluble Prussian blue and carmine of indigo mixed together, according to their combining proportions. He has found that these two blue coloring substances dissolve one another and combine to form a new blue of definite composition, which possesses the property of being applied to fabrics made of both vegetable and animal substances, either with or without mordants. This blue is a clear color, and does not vary in artificial or solar light.

Improved Stave Machine.

The American lumber trade, in relation to staves, is of vast extent. It gives employment to many thousands in almost every section of the country, and a very large capital is invested in the machinery used for the several operations connected with it. Staves must be obtained for all the barrels and hogsheads made at home; besides, we export most of the staves required for making hogsheads in England. These facts will at once render apparent the importance of any improvement, however small, that may be made in any of the machines used for riving or splitting staves from the rough blocks. The accompanying engraving is a perspective view of an improved machine for cutting out the staves from bolts. There are various kinds of stave cutters. This one belongs to that class in which a reciprocating knife is used and made to give a curvilinear cut, passing through the bolt of wood, until it comes down against the bed plate or the feed table which holds the bolt. The objects of the improvements are to preserve the edge of the knife from becoming dull by pressing against the feed plate; also providing a roller, set in elastic bearings in the knife gate, to afford a yielding pressure against the staves to prevent them from splintering while being cut. In the figure the framework is represented as formed of timber, but it is designed to construct such machines of iron, and they will be very compact and strong.

A represents the two sides which constitute the framing of the machine. B is a feed table extending across the framing. The bolts are placed upon it and fed into the cutter. C C are two short steel axes on which the cutter gate is hung and swings. A plate of metal is secured in a recess on the feed table along its front edge, so as to present a firm bed to the cutter. This bed would soon render the edge of the knife dull by its coming down frequently against it. To obviate this evil, strips of compressed india-rubber, D, are laid over the metal plate, so that, when the cutter descends through the block and cuts out a stave, it comes against a firm, instead of a hard substance. E is the swing gate of the knife. Its two knives are hung by the axes, C C, to the side supports. F is an under cross bar which unites the sides of the gate at the foot. G is the cutter head, consisting of a broad plate extending across the gate. H is the knife or cutter which extends across the gate, and is secured in a plate on the inner side of the head, G. Another plate, I, on the gate, extends across the frame. It has a series of rib guides secured to it, which pass up and down in guide recesses, J J, formed by adjusting pieces fastened on the front edge of the table, B, in advance of the strip, D, which can be compressed in its recess by the screws represented. R is a roller secured in recesses formed in the sides of the knife gate. It is situated behind the knife and opposite its lower edge. The axes of this roller have elastic spring blocks, *a*, of india-rubber, or other suitable substance, set in the recesses of the sides of the gate, and S S are screws for adjusting these, so as to set the roller in proper relationship with the cutter. The compressed rubber prevents the knife from cutting it.

The gate is now shown as raised to cut, and a bolt of wood supposed to be placed on the feed table, B. It is pushed forward so that the thickness of the stave to be cut is regulated by the guide ribs. The gate now descends, and the knife, H, cuts through the bolt, describing part of a circle in its descent; and when it comes against the strip, D, the cut stave falls down from the bolt. The soft nature of the india-rubber strip, D, prevents the cutting edge of the knife from becoming dull by coming in contact with the hard bed under it, and at the same time it gives a firm bed to the downward action of the cutter. The spring bearings of the roller, I, admit of a graduated resisting pressure on the staves, which tends to prevent them from splintering, and thus a greater number of sound staves are produced than would otherwise be obtained.



DOANE'S IMPROVED STAVE MACHINE.

The stave machine is the invention of Mr. W. H. Doane, who has made application for a patent, and from whom further information may be obtained by addressing him at Box 4,396, Chicago, Ill.

Improved Clothes-wringer.

Although a great deal has been done in the way of inventing labor-saving machinery for household purposes, we believe there are still great opportunities left for further advancement in this direction. Most of the hand-washing machines we have examined are made so heavy and are so difficult to operate that they rather increase than diminish the labor of washing. This is the reason, we think, why washing machines have been so comparatively limited in their introduction, although the number which has been brought before the public, from first to last, is legion. To render labor more light and pleasant should be the aim of every inventor, and this is the design of the clothes-wringing machine represented by the accompanying engraving. The object of it is to press the water out

COLBY'S IMPROVED CLOTHES-WRINGER.

of washed clothes and obviate the labor of wringing, which is the hardest part of the work.

This invention consists of a very simple attachment to a common washing tub, or it may be attached to a washing machine, with which, by turning a crank handle, and running the clothes between a pair of pressure rollers, the water is pressed out, and they drop into a basket underneath ready for drying. Fig. 1 is a perspective, and Fig. 2 is a side section of the invention. A pair of india-rubber rolls are hung on a neat frame of galvanized iron, which is clamped to the wash tub in the manner clearly shown in Fig. 2; the washed clothes are placed between the rolls and the handle turned, when the clothes are carried between them, and the water is squeezed out: *a a* are the upright standards of the iron frame, which are held fast to the side of the tub, *b*, by india-rubber spring pieces at their lower ends. These press opposite to one another on each side of the tub, and thus they retain the frame in position. The standards are united together by the bar, *c*, at the top: *d d* are the two pressure rolls, and *d'* is a back roller, over which the pressed clothes are guided into the basket. The upper pressure roller is secured between two curved swing arms, *e*, and from the nature of the material of which the rolls are composed, as well as the arrangement of the upper with the lower one, they accommodate themselves to the inequalities of the clothes, and maintain a regular pressure upon them. It will also be observed that the pressure of the rolls upon the clothes operates to make the lower ends of the standards hug fast to the sides of the tub, so as to keep them in position.

The partial drying of clothes by this simple and convenient apparatus can be performed far more rapidly and with greater ease than by the common method of wringing. It is a labor-saving machine, adapted for use in all families, and it appears to us that, while it saves labor, its action will not tend to wear and tear linen like that of wringing.

A patent was granted, through the Scientific American Patent Agency, for this improvement to George I. Colby, of Waterbury, Vt., on Dec. 4, 1860; and further information respecting it may be obtained by addressing Howden, Colby & Co., as above.

Coloring Matter of Flowers.

Some interesting researches on vegetable coloring matters have lately been concluded by M. Filhol, of Paris. He has extracted the coloring matter from white flowers, and finds it to possess the following qualities:—It is a clear yellow solid, soluble in water, alcohol and ether, and furnishes very beautiful lake colors with metallic oxyds, and can be used for painting and dyeing fabrics of a bright and very durable yellow. It has been named xanthogene. The colors of red and blue flowers are found to be due to a similar proximate principle, which will be blue in flowers with a neutral juice, and red or rose colored in those where the juice is acid. The name of this coloring matter is cyanine, a solid uncrystallizable body, soluble in water, and capable of being applied to many uses in painting. In yellow flowers two distinct coloring substances have been found, named respectively xanthine and xanthene. Another body, named crocoxanthine, is also met with in all the species of the genus *Crocus*. It is a solid, uncrystallizable body, of a beautiful golden yellow color, which is neither altered by acids nor alkalies; it is soluble in water and alcohol, but insoluble in ether; it produces, with some metallic oxyds, beautiful lake colors; and can be fixed upon fabrics, where its tinctorial power is remarkable. M. Filhol, in a memoir read before the Academy of Sciences, gives some valuable hints on the preservation of fresh flowers. We may preserve many flowers for a long time in a fresh state by enclosing them in sealed tubes. At the end of some days all the oxygen of the air confined in the tubes will have disappeared, and will have become replaced by carbonic acid. If we introduce into the tubes a little quicklime it removes from the flowers some of their humidity, which facilitates their preservation. Lime also takes up the carbonic acid, and the flower thus becomes placed in pure nitrogen. All flowers are not preserved alike by this process; yellow flowers are those which are altered the least.

Lighting Steamers with Gas.—The Birkenhead Commissioners are trying the experiment of lighting the cabins of their river steamers with gas, a quantity of which will be carried on board each steamer daily, thus following the example set by American steamboats.

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VOL. IV. NO. 2......[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, JANUARY 12, 1860.

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NEW WAR STEAMERS.

We recently directed attention to this subject in an article on page 361, Vol. III. (new series), of the SCIENTIFIC AMERICAN, but the great importance attached to it warrants us in recurring again to the question. We have a most inefficient navy at present in comparison with other powers, and one altogether inferior to what it should be considering the vast commerce of the United States. Our government has not been unmindful of this fact, a board of distinguished officers having been appointed last year by the Secretary of the Navy to examine the sailing ships of the navy for the purpose of determining the expediency of converting them into war steamers. This board has visited all our dockyards, made the requisite examinations, and reported the results to Secretary Toucey, who has given them briefly in his late published report. It is therein stated that it is not expedient to introduce steam power into any of the brigs, sloops or frigates, but that it is expedient to introduce it into all our ships of the line except the *Delaware*, which is too defective. Our steam frigates have cost each $725,000, and the cost of converting a line-of-battle ship in the navy into a steam frigate of the same class would be only $383,000. On the ground of economy, therefore, it is recommended, that the eight line-of-battle ships, now almost useless in our navy, be converted into war steamers at a cost of $3,064,000. As this recommendation will be acted upon in some manner by Congress, it demands a thorough investigation, so that the most reliable conclusions for securing a more efficient and enlarged navy may be arrived at.

The French and British naval authorities have already gone through the very same experience that we are just about undergoing. Not many years ago, they had a very large number of sailing ships of the line; and when it became necessary to form a steam navy, it was believed that these old ships could be converted into good steam frigates at less expense than would be incurred in building new vessels. But what has been the result? In a report of a committee appointed by the British Treasury to inquire into the navy estimates in 1858, it is stated that there is but a very small saving effected in the materials, while old ships never can be made so efficient as new ones built expressly for steam. Donald McKay, of Boston, who is now in London, states that the general and well established opinion of all the dockyard officers is, that "a very trifling saving, if any, is effected by the reconstruction of old sailing ships; and then, even with a considerably improved shape, such a ship will not last one-third as long or prove as efficient as a new ship of the same class. Our government is told to beware of being seduced into the scheme of converting our old sailing war ships into steamers. Without expending any money upon them, they will answer very well for harbor defense, as block ships, but not for efficient war steamers."

The necessity of increasing the navy is felt and pointed out by Secretary Toucey. He says:—

While we have a population of thirty millions of souls, a sea cost of vast extent on the Atlantic and Pacific oceans; a navigating interest of five millions of tuns; an annual export and import trade of six or seven hundred millions of dollars, and a home trade not less valuable, it would be strange and unaccountable in any one to suppose that the federal government, in providing and maintaining its present navy, has discharged its constitutional obligation. The constant appeal of American citizens, coming to us from all quarters of the world, asking for security and protection beyond what the government, with its present means, can afford them, speaks a language to which we are not at liberty to turn a deaf ear. * * * * *
I cannot permit the present occasion to pass without most earnestly recommending the policy of a gradual, substantial and permanent increase of the navy, accompanied by the universal introduction into it of the motive power of steam.

Such policy is essential to the protection of our coasts and commerce, and of American citizens and their property on the ocean and in distant countries, to the preservation of peace, the efficiency of negotiation, the general advancement of our commercial interests, the maintenance of our appropriate position among nations and the prompt vindication of our rights and of the honor of the country, and should be subject to none of the ordinary vacillations arising from the varied success of political parties.

Here we have it asserted that, owing to our inefficient navy, we cannot afford sufficient protection to American citizens engaged in commerce in various parts of the world. They are continually appealing for security and protection, and we cannot grant their requests. Is not this a disgrace to America? The great question is, how shall we best remodel and increase our navy? A new era has dawned upon the world; our old sailing war vessels, that struck terror into the Algerines and British during the days gone by, are now numbered with the relics of past ages. Steam is king of the ocean, and the nation which possesses the most powerful steam ships must be mistress of the seas. There are no two sides to this story; it can only bear one construction.

At present we have not a single first class war steamer—one that can compete with the most recently built French and British ones, and we regret that the Secretary of the Navy has not paid sufficient attention to these—we mean the iron-cased war wolves. Instead of frittering away ideas or money on old and effete ships, measures should at once be taken to construct several new steamers, embracing all the latest improvements. In another article attention shall be directed to the construction and terrific power of the new iron-cased frigates building by France and England.

WHERE DOES WEALTH COME FROM?

If a dealer in dry goods takes an account of his stock of property, a portion of it will be set down as a number of yards of cloth. Let us examine a piece of this—say a piece of sheeting—and see where the wealth in it comes from. In the first place, the cotton was raised on a Southern plantation. The seed was planted in the ground, and when the plant came up it was plowed and hoed till the cotton was ripe, when it was picked, baled and sent to market. By this process no new matter was created. It is regarded by chemists and philosophers as settled, that matter cannot be produced by man. The elements which form the cotton were previously floating in the air or resting in the earth. All that the planter did was to bring them together in new combinations, by which process he gave them value. It will be found that all production of wealth consists in changing the relation, or form, or location of some portion of matter in a way to impart to it *value*. After the bale of cotton reached the shipping port, it was placed on board of a vessel and sent over sea to the manufacturer. By this change of location additional value was given to it. The merchant is not only just as really a producer of wealth as the farmer, but he produces wealth in the same way. Both of them give value to matter by changing its location. The manufacturer draws the cotton out into long slender threads, and weaves it into a web of cloth; by this change of its form—of its several parts in relation to each other—giving it additional value. It then passes into the hands of the trader; who separates the large quantity into small parcels convenient for use, and transports it into the neighborhoods where it is wanted. By thus changing its location, and the relation of its several parts to each other, he imparts to it additional value. The trader is a producer of wealth in the same sense as is the farmer or the manufacturer.

There was a time when there was no wealth in the world: it is now to be reckoned by millions of millions, and if we examine each item of it, we shall find that all of this wealth has been produced by making changes in the form, or the relation of the parts, or the location, of the several articles of which wealth consists.

Let us take one more case—that of a ship. A certain value is given to the logs by cutting them down and transporting them to the saw mill—changing their location. They receive additional value by being sawn into plank or timber—removing the surplus, changing the relation of their several parts to each other. The transportation to the shipyard gives them additional value—changing their location. Then, cutting away the portions which are not wanted, and placing the materials together in the ship, gives them another installment of value. The ship constitutes $50,000 worth, or $500,000 of the wealth of the world, and all this wealth has been produced by changing the form of some material substance, or the relation of its several parts to each other, or its location, in such a way as to impart value to it.

It will be observed that the reason why these changes give value to the material is that they advance it a step in the process of adapting it to gratify some human want. If labor is bestowed upon an article in a way not to have this effect, such labor adds nothing to its value, and of course does not increase the wealth either of the laborer or of the world. If a farmer works the whole season to raise a crop which will satisfy no want, his season's labor adds nothing to his own wealth or the wealth of mankind. If a manufacturer makes such changes in the forms of his articles as not to increase their usefulness, he does not, by such changes, add anything to their value or to his own wealth. If a merchant buys hides in New York and transports them to Buenos Ayres, where they are worth less than they are in New York, he not only loses his own money, but diminishes the wealth of the world by the operation.

MOMENTUM,—Joseph W. Sprague's article on the Power of Bodies in Motion is necessarily deferred until next week. We have received a large number of articles on the subject of Momentum, in reply to Mr. Sprague's communication, some of which have not yet been examined; and we cannot say what disposition we shall consider it necessary to make of them. In the meantime, we publish a reply from Professor Silliman, which will be found in another column.

Fire Silverplating.

Although silverplating by means of the galvanic battery has become a great and most beautiful art, and now forms a large branch of manufacturing industry, there are various articles which still require to be prepared by the old method of fire plating. Having recently had several inquiries regarding these processes, we give the following information on the subject.

SILVERING BRASS AND COPPER.

A very thin coat of silver can be put upon brass or copper with a mixture of chloride of silver, chalk and pearlash, in equal proportions. The surface of the brass is first made perfectly clean, after which this mixture is slightly moistened with water and rubbed on with a clean rag. Of course it is not very durable, but it answers very well for some purposes.

Another method consists in applying, in the same manner, a moist mixture of 1 part of silver powder, 2 of cream of tartar, and the same quantity of common salt. When the surface of the brass is entirely covered with siler, it is washed in tepid water containing a small quantity of pearlash, then washed again in warm soft water, then finally wiped and dried before a fire.

A third method consists in taking 2 ounces of chloride of silver, mixed with 1 ounce of corrosive sublimate, 3 pounds of common salt and a like quantity of sulphate of zinc, all made into a paste with water. The brass being cleaned perfectly, it is covered with this paste, then dried slowly and heated very gradually up to a red heat, so as to expel the mercury which is formed by the reaction of the chloride of silver and corrosive sublimate. The brass now acquires a silvery surface, which is hightened by burnishing.

The French method of silverplating with silver leaf is as follows:—

The article to be plated is first raised to a red heat, then plunged into dilute nitric acid until it becomes bright and clean. After this, its surface is rubbed with pumice stone and hot water. It is now again heated to such a degree as to make a slight hissing sound when it touches water, in which state it is dipped again into dilute aquafortis, which bites its surface and makes it a little rough, so as to retain the silver leaf when applied. The article is now heated on a warm iron plate, called a *mandrin*, until it acquires a bluish shade, when the workman lays on two leaves of silver and rubs them down with a steel burnisher. After these two leaves are thus fastened on, the article is again placed on the *mandrin* and heated as before; then four additional leaves are laid on and burnisced down in the same manner. These operations are called "charging," and as many as thirty, forty, fifty, or sixty leaves are thus laid on, according to the solidity of silverplating desired. The whole surface is finally burnished with great pressure. Articles of copper and iron can be silvered in the same manner, only the iron is not submitted to the nitric acid action—its surface is first thoroughly cleaned, then roughened with a file for the reception of the silver.

The following is a method of silvering iron for which a patent was taken out in England, a few years since. A mixture of 12 parts, by weight, of mercury, 2 of sulphate of iron, 2 of muriatic acid, 1 of zinc, and 12 of water are heated in an open vessel to about 200° Fah. The iron is immersed in this and rubbed with it until the surface is coated with mercury. Molten silver is now kept at hand in a crucible, and into this the amalgamated article is dipped, when it soon becomes coated with the silver.

Articles formed of alloys of silver and copper are whitened by removing a portion of the copper near the surface, by heating them nearly red hot, then dipping them into sulphuric acid, which eats out some of the copper and imparts a blanched, "dead silver" appearance to the surface. Articles of alloys composed of copper and gold, when treated in the same manner, but using nitric instead of sulphuric acid, acquire a beautiful color, resembling what is termed "Tuscan work." The solder which is employed by silverplaters is composed of 2 parts silver and 1 of brass. The brass is a compound of 233 parts of copper and 100 of zinc fused together—the copper melted first in the crucible, then the zinc added, and the alloy thus made cast into ingots. Silver solder melts freely in a clear charcoal fire for which a blast is employed.

THE great underground railway in London, to connect all the railways of that metropolis, is being constructed with unflagging energy.

The Earth's Orbit—Climate Changes.

A pamphlet has been lately published by Mr. J. R. Hind, the well-known astronomer in London, on the question of secular change in the inclination of the earth's orbit. According to Mr. Hind the greatest deviation of the plane of the orbit from the position it occupied in 1800 is 4° 50′, and that this result is not liable to an uncertainty of more than five or six minutes. He states that there is apparently nothing to prevent the earth's orbit from becoming for a time sensibly circular, but those geologists who attribute the changes of climate, which have taken place in different sections of the globe, to a variation in the obliquity of the ecliptic are in error. A change of such magnitude as would lead to a subversion of the present order of things can never arise, according to his calculations.

Fossils of plants and animals now found in tropical countries only are obtained in the frozen regions of the North, thus showing that a warmer climate at one time, in the remote past, prevailed at the North. To account for this some geologists have supposed that variations in the obliquity of the ecliptic have produced great variations of climate on the entire surface of the earth. Mr. Hind evidently believes in no such theory. Other geologists, again, believe that the earth was once a mass of fire, and that its surface has gone through various degrees of temperature in cooling, sufficient to give a tropical climate to those parts of our globe which are now covered with eternal snows. This theory is also destitute of complete reliance, as fossils are now found in Scotland (according to Hugh Miller) of shell-fish which are only found in the Arctic seas, thus showing that, instead of a warmer, it had once a much colder climate. It has also fossils of tropical plants and animals, as well as those of the frigid zones, thus showing that it has gone through changes of different climates in the ages of the past. Neither the plutonic nor the astronomical theories account for these things. There is a boundless field still open for original discovery in the natural sciences.

Farm Implements and Machinery.

We copy the following excellent advice on this subject from the *Country Gentleman*:—

During the more leisure season of winter, farmers will find it advantageous to examine, repair and improve ali their implements and machines. It is in these that agricultural progress has been most strikingly marked within the past twenty years; and the cultivator who does not keep pace with the improvements made is wasting a valuable element of success. There is less danger of imposition in this direction than in some others, for a year's use will establish the character of any machine. A knowledge of the principles of mechanism, added to the experience which every observing farmer should possess, will enable him, in most cases, to judge with a good deal of certainty beforehand on the value of a new invention.

There are two points that should always be kept before the farmer's eye when making any provision of this kind. The first is, simplicity of structure. A simple machine is cheaply bought, easily managed, not easily deranged, and quickly restored to repair. Other things being nearly equal, always buy the simplest machine. The crowbar is a fine illustration—simple, efficient, used by every one, valuable for many purposes, and never out of joint. The great difficulty in replacing the plow with any other cultivating machine is its great simplicity. Complex husking machines have all given place to the old-fashioned appliance of thumb and finger, armed, sometimes, with husking thimble or peg, but oftener without.

The greatest advantage derived from machinery is where the powerful muscles of horses are made to accomplish what before was done by the weaker force of man—as in the mowing or threshing machine; or where the slow manipulation of fingers, with no expenditure of strength, is changed to a greatly increased rapidity of the same work by mechanical combinations, instances of which occur in the garden drill and the sewing machine. Some complexity is here necessary, and is admissible when great speed is gained; but when a machine works but little faster than the unassisted hands, it may be discarded, as a universal rule, unless extremely simple.

The second point to observe in providing farm machinery is to select such as each farmer can work with his own unborrowed forces. A threshing machine, for example, that requires six or eight horses to drive, one-half of which must be hired or borrowed for the occasion—or six or eight hands to man it, one-half of whom must be collected through the neighborhood before a sheaf can be threshed—is an inconvenient machine—troublesome, and not economical. If the farmer has but two horses and two hands, he should procure a thresher which they can work. He has then complete command of his own operations, and can, on any occasion, for a day, half day, or less, set his machine to work when he wishes a supply of grain for seed or for bread, or straw for his cattle. Many spare or stormy days may be advantageously occupied where such a convenience as this is always at hand. The farmer's wife will not complain of being relieved of boarding a number of hands required to man a ponderous ten-horse thresher, nor will he himself get the fidgets so often in seeing all his collection of men standing idle while a broken cog is undergoing repairs.

More simple husking machines and automatic gates than any heretofore brought before the public are yet to be invented. There is certainly great room for improvement in all agricultural implements of a compound character.

Why Does a South Wind Make the Sidewalks Wet Without Rain?

Yesterday the weather was cool and clear, but this morning there is a warm southerly wind, and the sidewalks are covered with moisture, though there has been no rain. As our citizens come out to their daily tasks, they all notice the fact; but how various are the impressions that it produces upon their minds! The little ragged girl shivers as the naked sole of her foot presses the dampness, and she anticipates the luxury of standing presently upon a warm grating, through which the steam is escaping from some subterranean steam engine; the dealers in overshoes and umbrellas look forward to a good day's trade, and the shipping merchant wonders whether it will rain and prevent his vessel from discharging the remainder of her cargo. But to the student of science, the phenomenon suggests the idea of its cause, and leads his mind into a train of thought which ramifies into every department of Nature.

The deposit of moisture from warm air upon a cold stone is owing to a property of the atmosphere which produces a large number of phenomena. After air has received a certain quantity of moisture, it will take no more, but warm air will hold more water than cold air. Now, when air which has been saturated with moisture by resting over southern seas, moves to the North and comes in contact with a cold flag stone, a portion of its moisture is condensed upon the stone. The proportion of water in the air has a very important influenee upon its properties, especially in relation to the skin, lungs and other viscera of the system. Probably the injurious effects of furnaces in dwellings are principally owing to the capacity of the air for moisture, and thus causing it to dry the lungs and skin. With open fires the heat is radiated through the air directly to the bodies of people in the room, and it is therefore not necessary to heat the air as hot as furnaces: hence, it will absorb moisture more rapidly. In other words, it is less drying.

COTTON SEED CAKE FOR FEEDING CATTLE.—The *Mark Lane* (London) *Express* has an editorial commending the best samples of this article as a valuable acquisition to the present catalogue of grazing substances, and concludes by quoting the following observations of Professor Woelcker on the result of a recent analysis of thin decorticated American cotton seed cake, lately imported:—1st. The proportion of oil in all the specimens is higher than the best linseed cake, in which it is rarely more than twelve per cent, and ten per cent may be taken as an average. As a supplier of food, cotton cake is therefore superior to linseed cake. 2d. The amount of oil in the several specimens differs to the extent of five and a half per cent. 3d. Cake contains a very high and much larger per centage of flesh-forming matter than linseed cake, and it is therefore proper to give to young stock and milch cows. 4th. In comparison with linseed, there is much less mucilage and other respiratory matter in cotton cake. This is compensated by the larger amount of oil. 5th. The proportion of indigestible woody fiber in decorticated cotton cake is very small, and not larger than in the best linseed cake. 6th. The ash of cotton cake is rich in bony material, and amounts to about the same quantity as is contained in other oily cakes.

THE WORKING OF MINES.—Mr. Cockburn, a distinguished engineer, has recently submitted to the British School of Mines a paper of much interest and value. He recommends round wire ropes as the best for drawing coal from pits where the depth is less than two hundred yards and flat wire ropes where it exceeds this. The beam engine, in consequence of its simplicity and economy, he prefers for the pumping machinery. The pumps, too, should be of a mixed character, plunges as well as dips. The shaft of a pit ought to be round, not less than seven or eight feet in diameter, and well walled throughout. Then, too, all shafts should have wood guides and be provided with signals. Cages should have movable covers, and when the cage is at the top there should be an arrangement for the ventilation of the shaft. Mr. C. also thinks that the furnace is the best arrangement for under ground ventilation, and gives it as his opinion that the air rooms should be of larger area than the shaft.

THE SCIENCE OF COMMON THINGS.

NUMBER II.

THE CHEMISTRY OF THE BREAKFAST TABLE—WATER.

"To-day we are to examine the constitution of water. This is not, like the metals, a simple substance, but is composed of two elements, which, though generally liquid or solid when combined with other elements, are, when separated from each other and everything else, only known in the form of gas. One of these is oxygen and the other is hydrogen. Oxygen forms about one-fourth part of the air we breathe. Hydrogen is the lightest substance known, and is therefore used to fill balloons with, to float up through the air."

"But, father, why can we not see these substances as well after they are separated from each other as we can when they are joined together?"

"I do not know. Nobody knows why we can see through a plate of glass when we cannot through a plate of iron. All gases are transparent, but why they are so we do not know."

"Is it known why they are lighter when they are separated?"

"They are not any lighter. One pound of hydrogen combined with eight pounds of oxygen makes nine pounds of water. The chemical combination of water is exceedingly simple, and if you will give me a couple of little balls I will explain it to you. Let us have one of them made of pith to represent an atom of hydrogen, and the other made of some wood, so that it will be eight times heavier though only half the size, to represent oxygen. Now, if we fasten with a thread one atom of oxygen to one atom of hydrogen, we shall have of an atom of water, thus—Oo. The oxygen atom, you remember, is one half as large as the atom of hydrogen, and eight times heavier. It is, in fact, eight and thirteen one-thousandth times heavier, but we will lay aside the fractions for the sake of simplicity."

"Why are these not still gases after they are combined together?"

"How easy it is for any boy to ask a question that no philosopher can answer. Professors Faraday, Liebig and Henry will all tell you that they do not know why the combination of hydrogen and oxygen should produce a new substance with properties so different from either of the elements when uncombined. However, by applying heat to water, it may be made to take the form of gas or vapor. If we take a number of these atoms and scatter them apart in this way—

Oo Oo Oo Oo Oo
Oo Oo Oo Oo Oo
Oo Oo Oo Oo Oo

we shall have an idea of their condition as steam. They are still combined together though; chemically considered, they are water. But if we blow them into a retort full of very hot charcoal, they will be separated; in other words, the steam or water will be decomposed. Water may also be decomposed by electricity. If we arrange the poles of a galvanic battery properly, we can decompose water, and carry all the oxygen into one jar and all the hydrogen into another, when the atoms will be separated thus—

o o o o o O O O O O
o o o o O O O O O
o o o o o O O O O O

The hydrogen coming from nine pounds of water weighs one pound, and the oxygen eight pounds; but the hydrogen fills twice as large a jar as the oxygen."

"What is the shape of these atoms?"

"They are so small that they cannot be seen with the most powerful microscope, but there are so many facts which point to their existence that they are generally believed in. The atom of hydrogen is the very lightest atom known, and is therefore taken as the standard to compare all others with. Its weight is called one, and as the atom of oxygen weighs eight times as much, the atomic weight of oxygen is eight. In works on chemistry the 62 simple elements are mentioned so frequently that it is usual not to write out the name in full, but to use merely the initial; thus, H stands for hydrogen and O for oxygen. As the two combined form water, whenever you see (HO) in chemical books you may know that it means an atom of water. You now understand that joke you saw in *Vanity Fair*."

"What one? I don't remember."

"The Chemistry of the Bible—HO, every one that thirsteth!'"

"They would have the HO to drink, would they?"

Taking Photographs by Night.

English photographers are conducting with great learning and ingenuity a series of experiments with the view of obtaining an artificial light for taking photographs. We find in the London *Photographic News* the following account of some preliminary experiments which were made by Mr. Crookes in 1856, at the expense of the government. It will be remembered that the chemical or actinic rays of the sunbeam which produce the changes of shade in the photograph are entirely different from those which affect the eye, hence an artificial light might be very brilliant to the eye and still exert very little power upon the sensitized plate or paper.

The two great sources of artificial light, electricity and chemical action, were successively tried, the former, however, not being considered so promising a field as the latter, owing to the great expense and difficulty attending its use, and for the further reason that the requirements of the case rendered portability a great consideration. Trial was made of the "electric egg," or the luminous glow which is produced when the secondary current, from a powerful induction coil, is passed through highly attenuated gaseous media enclosed in glass tubes. But although a spectral analysis of this light showed that the photographic rays of light were present in enormous quantities in proportion to the visible rays, they were insufficient to affect a sensitive collodion plate when reflected from an object, removed to any considerable distance.

The light produced when voltaic contact is broken between mercury poles (the progenitor of Way's mercurial light) was found to be very intense and to contain much higher and stronger actinic rays than even sunlight; moreover, it was not open to the same objection as was the carbon electric light, as the battery power required would be less, and the motive arrangement at the point of light might easily be rendered automatic. Mr. Crookes was perfectly successful in taking good photographs by this light, but as it was probable that greater success might be obtained at a less expense by directing attention to some other chemical source of light, the experiments in the above direction were discontinued.

The light evolved from the combustion of sulphur, carbon, and phosphorus in oxygen gas was next experimented on, but with the exception of the latter no good result could be obtained with either. Phosphorus burning in oxygen produced such a brilliant photographic light, that if it were possible to devise a safe and convenient apparatus for its production it might doubtless be made available for photographic purposes. Photographs were likewise taken by Mr. Crookes with this light.

An attempt was then made to combine both the combustible body and the source of oxygen together, and so produce a light analogous to those employed for pyrotechnic purposes. Mr. Southby, the well-known artist in fireworks, was employed to make several intense lights of different colors, and in convenient forms for experimenting with. These experiments were, however, discontinued, as although the light might perhaps have been obtained sufficiently strong for the purpose, yet the volumes of smoke arising from the combustion proved an insurmountable difficulty; and even could this have been obviated, the results of combustion, such as sulphurous acid, and in some cases even compounds of arsenic and antimony, would seriously endanger the health of the operator. The *bude light*, obtained by employing an ordinary argand gas burner with oxygen, instead of air, was experimented with, and found not to yield sufficient actinic light.

By far the most promising line of research was that upon the light evolved when some of the earths, lime, magnesia, or zirconia were rendered intensely incandescent by heat. The ordinary lime light, in which a a cylinder of lime is heated by means of the oxhydrogen blowpipe is an example. The ordinary apparatus was found to be quite insufficient for the purpose besides being attended with considerable danger. Mr. Crookes, however, succeeded after some time in forming an arrangement for the evolution of light from an earthy compound—differing from and far superior to lime—which, whilst more intense than the lime light, was entirely unattended with danger. This was the line of research which was ultimately decided upon, and which Mr. Crookes strongly urged should be followed up, as being likely to prove successful in its application to photographic purposes. The spectrum obtained from an incandescent earth was found not to contain such high rays as those from electric sources, not being more extended than that from sunlight, but they were seen to be tolerably intense, and had the advantage over the mercury spark, in that they were continuous throughout the whole length of the spectrum.

By taking photographs in the ordinary way, illuminating the object by means of the incandescent earth light, one difficulty was met with of the shadows being very hard and sharp; this was got rid of by increasing the diameter of the incandescent earth by interposing ground *quartz* (not ground glass, as that intercepts many of the valuable rays) between the light and the object, close to the former, or by employing reflectors. Ultimately, however, this difficulty was easily and simply overcome by moving the source of light in different directions during the time the picture was being taken; by that means a roundness and transparency was obtained in the shadows, similar to that produced by diffused daylight. It was also shown that it was possible to entirely get rid of all the shadows in this manner by so arranging the successive foci of light, and the time during which each acted, that every side of the prominent parts of the object would be equally illuminated. It was proved in this manner that a hard sharp outline was by no means necessary to an object illuminated by light issuing from a point. We do not know the details of the light-producing machinery contemplated by the Lime Light or the Fitzmaurice Light Company, but we should imagine that a careful study of some of the points experimented upon by Mr. Crookes would prove of considerable advantage, as we are assured by competent authorities that the light produced by that gentleman has never been surpassed.

INVENTORS.—The London *American* says:—"While many an inventor has lived and died in a garret, a fortunate few end their days amid the bounteous fruits of their labor. As there is no class in the community to which the world is so much indebted, so there is no class more generous with their wealth. In America, perhaps, more than in Europe, the inventors are likely to reap a fortune, as the rapid development of the sources of wealth and the scarcity and comparatively high price of manual labor, necessitate the almost immediate introduction of any really useful labor-saving machine. This is especially true of agricultural implements, and often large fortunes are realised on simple articles of this description. A gentleman by the name of Mr. Peeler, who is said to have realised $400,000 (£80,000) from the sale of a patent plow, has recently proved the profitableness of his invention and the goodness of his heart by giving $200,000, or £40,000, of this sum to the Methodist Church of the United States."

A ROYAL RING.—A remarkable ring has lately been picked up in the Champs-Elysées, Paris, and committed to the safe keeping of the police. This ring, which is quite new and very magnificent, has a royal crown in diamonds, with the cypher V. A. in diamonds. Under the bezel is a tiny stereoscope, the eye-glasses of which are scarcely larger than the head of a pin, the dimension of the two tubes being less than that of a very small crow-feather. Holding this ring between the eye and the light, the portraits of the Prince Consort and the Prince of Wales become visible. This ring belonged to a box of jewelry destined for the English court, but was stolen from the house which had received the order.

TRADE.—The Boston *Commercial Bulletin* says that the general tendency of things is for the better. Eight weeks ago, prosperity in trade and commerce was never more bright or more general. There has been no overdoing in business; there have been no financial corruptions; there has been no sudden breaking up of unsound concerns, as in 1857, to banish this prospect. We have simply given way for the moment to our fears, and magnified our weakness when we should have taken courage in our strength.

THE King of Prussia's strength is visibly declining, and his moments of lucidity are more and more rare.

AMERICAN NAVAL ARCHITECTURE.

[Reported for the Scientific American.]

THE CALORIC PROPELLER "PRIMERA."

The hull of this vessel was constructed by Messrs. Sneeden & Co,, of Greenpoint, L. I. Her owners are Messrs. Pesant, Brothers & Co., of this city, and the route of her intended service is the coast of the island of Cuba. As the introduction of Captain Ericsson's hot air engine into this vessel is regarded as perfectly successful, we give the annexed minute details of her hull and machinery.

Length between perpendiculars, 135 feet; extreme length on spar deck, 144 feet; breadth of beam, 22 feet; breadth over guards, 34 feet; depth of hold, 9 feet; draft of water at load line, 6 feet 3 inches; displacement of vessel at load line, 10,800 pounds to the inch; tunnage, 330 tuns. Her frames are of angle iron 3x3x$\frac{3}{8}$ inches, spaced 18 inches from center to center, every alternate frame having a vertical floor plate, 9 inches deep and 5-16ths of an inch wide, securely riveted thereto. There are five fore-and-aft keelsons, viz: one center, 12 inches deep; two sister, 10 inches deep, and two bilge, which are 8 inches in depth; these keelsons are made of iron 5-16ths of an inch in thickness, and are thoroughly fastened to the shell of the vessel, and strengthened on their top edges by bars of angle iron 3$\frac{1}{2}$x3$\frac{1}{2}$x7-16th inches.

The deck beams are of angle iron 6x$\frac{1}{2}$ inches, and are riveted to the head of every alternate frame; they are also secured by plate iron knees, $\frac{1}{4}$ of an inch in thickness at each end, and have scantling beams attached, extending out 6 feet beyond the hull, forming a guard all around the vessel; the ends of the above beams are flanged, and receive a stringer iron 6x$\frac{3}{8}$ inches around their extremities.

The guards are diagonally braced with iron rods fastened to the deck beams and to the sides of the vessel. There is a stringer plate 15 inches wide and 5-16ths of an inch in thickness, extending entirely around the hull and fastened to every deck beam, and also to the shell of the vessel, by a bar of angle iron 3x3x$\frac{3}{8}$ inches. The plating is of various thicknesses, as follows: thickness of keel, 9-16ths of an inch; do. of garboard streak, $\frac{3}{8}$ inch; do. from garboard streak to turn of bilge, 5-16ths of an inch; do. of wale streaks, $\frac{3}{8}$ inch; the rivets in her keel are $\frac{3}{4}$ inch diameter, and those in the plating are $\frac{5}{8}$ inch in diameter.

The *Primera* is fitted with a double-acting, condensing, pressure, caloric engine (Ericsson's patent); diameter of cylinders, 40 inches; length of stroke of piston, 24 inches; diameter of propeller, 8 feet; pitch, 16 feet; length of same, 19 inches; length of blades, 30 inches; weight of the engine, propeller, &c., 70,000 pounds; length of engine in the vessel, 14 feet; length of engine room, 8 feet.

She is also supplied with two heaters, which keep the pressure of air at 85 pounds per square inch; the consumption of coal (anthracite) per hour is 85 pounds; the heaters are located in the hold.

In addition to these essential features, she has 2 smoke pipes; independent rudder post, and 2 athwartships watertight bulkheads made of $\frac{1}{4}$ and 3-16ths of an inch iron; the whole is vertically stiffened by bars of angle iron 2$\frac{1}{2}$x2$\frac{1}{2}$x5-16ths inches, placed 3 feet apart. Said bulkheads are perforated with suitable holes, which are provided with valves to shut watertight. Her rig is that of a schooner. The machinery was constructed by Mr. C. H. Delamater, foot of Thirteenth-street, East river, this city.

Recent American Inventions.

DUMB WAITER.

In one of our recent numbers, we had occasion to publish the claims of the second patent which was granted Dec. 4, 1860, to Andrew Murtaugh, on dumb waiters. By his untiring efforts for more than four years, this inventor has succeeded in bringing his machines to heretofore unattainable perfection. They can be used with equal advantage in dwelling houses and in stores. Their action is safe and steady, and so perfectly direct that nothing can get out of order; they are not liable to jar, spill or break the articles conveyed on them. Their mode of construction gives purchase for heavy articles—such as trunks, coal, &c.; they are so arranged that coals can be hoisted or ashes lowered on them without soiling the waiters. They can be used as a fire escape if the communication with the stairs is cut off, as a person can stand on the top and hoist or lower himself with ease; they require less head room than other dumb waiters, and they can be fastened in any story and left without danger of their falling; and, finally, they can be made cheaper than others, considering their durability and the advantages gained. We can speak of the utility of this invention, from having used one of the dumb waiters for some time in our dwelling, with great satisfaction. The inventor, Andrew Murtaugh, No. 1,272 Broadway, corner of Thirty-fourth street, this city, will be pleased to give further information in regard to his invention.

SEWING NEEDLES.

This invention, by Henry Essex, of Haverstraw, N. Y., is adapted to needles for all ordinary kinds of sewing by hand. It consists in giving to needles a triangular form in the body or wider portion, but retaining the usual round form at and near the eye and point. The object of this invention is to give them greater strength without giving them greater substance.

What is Wealth?

The wealth of the world, of the country, or of individuals consists, to a very small extent, of money. If all the money in the world were instantly annihilated, there would still be very rich nations and rich people. The wealth of a farmer consists in acres of land, in houses and barns, in droves of cattle, in stacks of hay, in bins of grain, &c. The wealth of a manufacturer consists in his manufactory, his machinery, his stock of raw material and of manufactured goods; the wealth of a merchant, in his ships and merchandise.

It is not the circumstance that these articles will exchange for money that makes them wealth. It would be much more proper to say that a bank bill is wealth because it will buy a barrel of flour, than it would to say that a barrel of flour is wealth because it will exchange for a bank bill. Two things are requisite to make any material substance an article of wealth; one is that it should be desirable, and the other that it should be difficult to obtain. Air is as necessary to our existence as any substance whatever, but from the fact that nature has provided it in boundless abundance, it constitutes no part of our wealth. The same is usually the case with water; but wherever water is difficult to obtain it becomes wealth. There are large cities in which all the water used is brought on mules' backs or men's heads, and sold like any other commodity.

Any article, in order to be property, must not only be difficult to obtain, but it must satisfy some human want. It makes no difference, in this respect, whether the thing wanted is good for people or injurious, provided only that they desire it; therefore rum, arsenic and faro checks are just as really wealth as bread or Bibles, or volumes of the SCIENTIFIC AMERICAN.

In another article we have pointed out just what relation money does bear to the whole wealth of mankind; we desire here merely to call attention to the fact that it is no more wealth than any other kind of property, and that it constitutes a very small part of the wealth of the world. There were many rich men before there was any money.

THE NEW FACTORIES AT LAWREFCE.—The work on the Pacific Mill in Lawrence is progressing as fast as possible. A large portion of the machinery for the extension on this mill will not be due until next April. As fast as it arrives, it is put in working order, but the company has never contemplated getting the extension in operation before early Spring. The new Pemberton Mill is in the same position. Machinery is daily arriving, and being put in running order, and the work, notwithstanding monetary "ups" and "downs" is being hurried along to completion as heartily as ever. But the mill will not get fairly started before Spring.

A PHOTOGRAPHIC QUIETEST.—The following novel and effectual method of keeping sitters quiet while their pictures are being taken is from the *Journal of Photography*:—We have read a story of an artist "way down South in Dixie," who adopted a novel expedient to keep his sitter quiet. He had tried all sorts of suasions without success, when it occurred to him that the strongest of all human motives is fear. As soon as he had completed his adjustments, he suddenly draws a revolver, and leveling it at the sitter's head, he exclaims in a voice and with a look suggestive of lead and gunpowder:—"Dare to move a muscle, and I'll blow your brains out."

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING DECEMBER 18, 1860.

Reported Officially for the Scientific American.

[There were no patents issued on Christmas week, and the annexed is a continuation of the List issued on the 18th ult., which were omitted from our last number, owing to the official copy not reaching us at the time of going to press.]

30,956.—L. H. Bowman, of Norristown, Pa., for an Improvement in Operating the Valves of Steam Engines:

I claim, firstly, The reciprocating box, C, its spring sliding bars, E and E′, each having an inclined projection, the arms, F and F′, with their inclinations, in combination with the valve levers, K and K′, and their rollers, q, the whole being arranged and operating substantially as set forth.

Secondly, I claim the spring sliding bars, E and E′, each having a projection, m, in combination with the bell crank levers, G and G′, and the sliding block, I, the position of the latter being regulated by the governor, and the whole being arranged for joint action substantially as and for the purpose set forth.

Thirdly, The vibrating arm, Q, with its segment, b, and adjustable curved blocks, r, and r′, in combination with the exhaust valve levers, N and N′, the whole being arranged and operating substantially as specified.

30,957.—B. F. Campbell, of Roxbury, Mass., for an Improved Steam Boiler:

I claim the combined arrangement of two wings, E, containing the tubes, I, with a single fire box; when the said wings project equally from either side of the fire chamber over the grate, as and for the purposes set forth.

Second, I claim the perforated plate, L, for bridging the crown sheet, F, substantially as set forth.

30,958.—J. A. Chapman, of Pequetanuck, Conn., for an Improvement in Machines for Winding Woolen Rovings:

I claim, first, The arrangement of the wheel, L, bar, Q, sliding frame, D′, swinging frame, D, guide bar, l, and sliding bar, S, operated as shown, or in any equivalent way, for the purpose of shifting the frame, D′, and presenting the empty spools consecutively before the guide, N, to receive the roving, V.

Second, Operating, for the purpose specified, the bar, Q, through the medium of the spring, a′, ratchet, N, with pin, w, attached, and the pawl, v, arranged as described.

Third, The employment of a series of spools, F, when placed on a common shaft, E′, and filled or wound consecutively by a continuous roving, substantially as set forth.

30,959.—Elisha Clark, of New York City, for an Improvement in Copying Presses:

I claim, The arrangement of the anti-pressure bridge, C, studs, a, screw, S, and nut, F, with the plates, B B′, rods, f, and springs, s, in the manner and for the purpose herein shown and described.

[This invention consists in the combination of the screw or hand wheel and adjustable or anti-pressure bridge and its four relieving studs, with the upper or adjustable bed plate. The said wheel and bridge being arranged below the primary bed plate, whereby the top of the machine is entirely unobstructed by screws or levers or other equivalents which occupy that position in the ordinary letter presses, and consequently it may be used as a shelf or table upon which the book may be placed for inspection, &c.]

30,960.—Jud Crissey, of Chatfield, Minn., for an Improvement in Water Wheels:

I claim, first, The employment or use with one or more wheels, D E, of a series of concentric gates or cylinders, constructed as described, and arranged relatively with the buckets, d, to operate as and for the purpose set forth.

Second, The arrangement of two wheels, D E, fitted in a frame or box, B, in a flume, or penstock, A, when provided on one and the same shaft, C, with consecutive cylinders or gates connected as shown, so that the gates of both wheels will be operated by adjusting the outer one of the upper wheel essentially as and for the purpose set forth.

[This invention has for its object the regulating of the capacity of the wheel according to the power required, so that any given power less than the maximum may be obtained with an economical expenditure of water; that is to say, a greater or less power may be obtained from one and the same wheel by a supply of water proportionate to the power required, a result which is not attained with the ordinary wheels which depend solely on an ordinary gate to regulate the supply of water to them. In this case the wheels always require proportionately a greater volume of water when giving out a power less than the maximum.]

30,961.—J. G. Dunham, of Raritan, N. J., for an Improvement in Mowing Machines:

I claim, first, the combination of a finger beam, D, or its equivalent with the hinged piece, F, its projection, K, adjustable piece, F′, and its shoulder, K′ for the purpose set forth.

Second, I claim the combination of shoe, E, truss rod, G‴, and piece, H, with finger beam, D, and parts, F F′ and G, arranged in relation to each other and the main frame, substantially as shown and described.

Third, I claim, in a mowing machine, the combination of the following elements, namely, a main frame, two independent driving and supporting wheels, a castor wheel, a hinged folding finger beam and a knife reel," said parts being arranged in relation to each other and operating substantially as described.

Fourth, I claim the mechanism for throwing the cutter out of action, substantially as described and shown in Fig. 6.

Fifth, I claim the combination with the main frame and supporting wheels of a stationary metallic axle or journal piece, constructed substantially as described and as shown in Figs. 1 and 4, for the purposes set forth.

Sixth, I claim the combination with the main frame of a mowing machine of a knife reel and a hinged folding finger beam.

30,962.—J. D. Forrey, of Lewiston, Pa., for an Improvement in Machines for Hulling Clover:

I claim, first, The combination of the peculiarly shaped concave with the peculiarly shaped beaters or spikes, for the purposes and substantially as described.

Second, I claim, The arrangement of the sieves, s s, the apron, a, and the movable roller, R, actuated simultaneously by the means of the eccentric, g, all constructed and operated as and for the purpose set forth.

Third, The arrangement of the peculiarly shaped concave and beaters, with the endless apron for the purpose and substantially as described.

30,963.—J. B. Geisinger and D. H. S. Williams, of Montville, Ohio, for an Improvement in Cultivators:

We claim, The arrangement of the curved bars, C, slotted braces, M M, hinged to bar, J, standards, N N, shares, Q Q, eye bolts, S S, links, R R, bar, K, bolt, L, beam, A, and handles, E E, the whole being constructed substantially as described.

30,964.—Charles Graham, of Scranton, Pa., for an Improvement in Spring Balances for Safety Valves of Boilers:

I claim, first, The employment in combination with the spring of a spring balance for safety valves of an eccentric, e, and lever, F, applied to operate substantially as herein specified for the purpose set forth.

Second, the arrangement of the eccentric shaft, E, spring, G, levers, B B, cross bar, D, and the pressure bar, H, with its screws and nuts, f f g g, substantially as herein described, in combination with each other and with a bed plate, A, or other equivalent base or support.

30,965.—J. S. Gray, of New York City, for an Improvement in Vapor Lamps:

I claim, The combination of the wick tube, C, bracket, D, conductors, E, and heater cap, F, when arranged for joint operation, substantially in the manner described for the purpose set forth.

30,966.—Joseph Gum and St. Clair Gum, of Marseilles, Ill., for an Improvement in Cultivators:

We claim, The lever, E, in combination with the levers, L L, the open slot standards, S S, and the slots on the lower cross piece, H, by which to control the movements of the plows, when arranged as set forth and substantially as is described.

We claim, The driver's seat, D, in combination with the several elements of the preceding claim, when arranged as set forth and substantially as described.

30,967.—Jacob Haege, of Shiloh, Ill., for an Improvement in Gang Plows:

I claim, first, The employment or use of vertical pivots, a, passing through the center of the axle in combination with chains, c and f, as and for the purpose described.

Second, The arrangement of the hinged slotted standards, J, in combination with the screw rods, K, guards, n, and nuts, m, and with the adjustable plow shares, D, all constructed and operating in the manner and for the purpose set forth.

Third, The arrangement of the swinging rods, f', in combination with the lever, F, and beams, C, constructed and operating as and for the purpose specified.

Fourth, The arrangement of the belly strap, I, in combination with the lever, F, treadle, H, and beams, C, constructed and operating substantially in the manner and for the purpose described.

[The object of this invention is to construct a gang plow which will work easy and with comparatively little power and which allows of regulating the depth to show the depth to which the shares cut into the ground, or to throw the plow out of the ground altogether, and to keep them there without extra exertion of the driver.]

30,968.—C. E. Haskins, of Providence, R. I., for an Improvement in Shirt Studs:

I claim an improved shirt stud, constructed not only with its shank tubular and recessed as explained, but with a lever applied and arranged with respect to such shank as described, and provided with a spring arranged in the shank and operating so as to maintain the lever at right angles with the shank under circumstances as set forth.

30,969.—A. H. Hews, of Cambridgeport, Mass., for an Improvement in Slides for Watch Ribbons:

I claim, The slide, A, and pin, c, operating substantially as described.

30,970.—Jasper Johnson, of Genesee, N. Y., for an improved Butt Hinge:

I claim the combination of leaves, A B, tapering headed and grooved pin, P, second pin, i, stud, a, and cavity, b, constructed, arranged and operating as and for the purposes set forth.

30,971.—Nelson Johnson, of Jasper, N. Y., for an Improvement in Water Wheels:

I claim the inclined buckets, f, being of concave form in their horizontal section, and of gradually decreasing width from top to bottom, in connection with the inclined or beveled lower rim, b, essentially in the manner and for the purpose set forth.

[This invention relates to that class of water wheels which discharge the water at the center, and are commonly called center-vent wheels. The object of the invention is to obtain both the impact and the reacting force of the water in a way that will give a better result than any hitherto devised.]

30,972.—Solomon Kepner, of North Coventry, Pa., for an Improvement in Detaching Horses from Carriages:

I claim the combination of the bar figure, 9, and the revolving singletree with its two hooks and guide, arranged as described for the purpose set forth.

30,973.—Moses Kleeman, of Columbus, Ohio, for an Improvement in Glass Cutters:

I claim the combination of the socket and cap, substantially as and for the purposes set forth.

30,974.—J. H. Knight, of Newburyport, Mass., for an Improvement in Shoe Tacks:

I claim a shoe tack constructed with an elongated inclined head, B, as herein shown and described.

[This invention relates to the improvement in tacks which are employed for securing the inner sole and the upper to the last while the latter parts are being secured together. The object of the invention is to prevent the thread from catching the tacks during the operation of sewing, a contingency which occurs with the ordinary tacks, causing either the thread to break or the tacks to be drawn out from the last. The invention consists in having the tacks provided at their tops with flat strips which form inclined planes where the tacks are driven into the last, and allow the thread to slide over the tacks.]

30,975.—F. W. Kroeber, of Forbestown, Cal., for an Improved Wrench:

I claim the application of the lever and the curved ratch to the adjustment of the jaws of the wrench, as described.

30,976.—G. W. Lathrop, of Weedsport, N. Y., for an Improvement in Exhaust Pipes of Locomotive Engines:

I claim, first, The combination of an adjustable beveled guide flange or lug, G, and adjusting rods, I I, which extend out beyond the front of the smoke arch, A, with the seat, E, and stationary beveled guide lug, F, of the exhaust pipes, D D, and the slide, J, that carries the variable exhausting nozzles, M M, substantially as and for the purposes set forth.

Second, In combination with exhaust pipes, D D, which branch out towards the sides of the smoke arch, and terminate in a slide seat, E, that runs across the arch, I claim the combined arrangement of a slotted link, K, that takes hold of the remotest end of the nozzle slide, J, a vertical rod, d, two horizontal crank arms, e f, set at right angles to one another and a horizontal longitudinal lever, L, substantially as and for the purposes set forth.

30,977.—William Mallerd, of Bridgeport, Conn., for an Improved Gas Burner Regulator:

I claim making the inner tube, C, vertically adjustable in its socket, A, substantially as shown and described, so that the flow of gas through the orifices of said tube may be increased or diminished and thus regulated at pleasure, by raising or lowering the said tube so as to bring a greater or less number of the orifices above the head of the socket, all as set forth.

I also claim the arrangement of the escape orifices of said tube, C, or varying horizontal planes, as and for the purpose set forth.

I also claim the exterior graduation of said tube, C, as shown and described, so that the quantity of gas which issues through the orifices when the tube is set to any given hight, will be indicated to the eye, all as set forth.

30,978.—R. C. Mauck, of Harrisonburg, Va., for an Improvement in Machines for Cleaning Grain:

I claim, first, The combination of the inclined cylinder, A, and rotary longitudinal buckets or scoops, M N, constructed and operating in connection with a fan blast substantially in the manner set forth to subject the grain to a succession of falls in its passage to the lower end of the cylinder and expel the lighter refuse at the upper end.

Second, The right and left flanges, D D', in the described combination with the reel, B C N, and inclined cylinder, A, for the purposes explained.

Third, The transverse checks, J, in the described combination with the inclined longitudinal buckets, M N, and fan, E, for the purpose set forth.

Fourth, The guard, O, applied between the fan, E, and spout, L, substantially as and for the purposes explained.

30,979.—P. F. Milligan, of Baltimore, Md., for an Improvement in Railway Signals:

I claim the combination and arrangement of the series of wheels, A B C D, and pinions, b e d, axle, a, ropes or chains, x y, attached to spans, n n, lamps or signals, E G, pole, P, with ratchet rack, S, and spring, r, with suitable framing, the whole constructed and operating substantially as and for the purpose specified.

30,980.—J. B. Murray, of New York City, for an Improvement in Envelopes:

I claim the openings, A, in one or both ends of the envelope, substantially as described and for the purpose set forth.

30,981.—R. C. Nash, of Somerville, Tenn., for an Improvement in Cotton Seed Planters:

I claim the combination and arrangement of the hinged drill tooth, G, and driving wheel, B, of the seeding wheel, M, with alternate pins, r r, and blades, s s, and shaft, I, with alternate oblique pins, t t t, substantially as and for the purposes specified.

30,982.—M. F. Noraconk and D. Hoats, of Milton, Pa., for an Improvement in Machines for Hulling Clover Seed:

We claim, first, The rotating and stationary hulling disks, a d f, in connection with the screw, G, and fan, E, arranged for joint operation, as and for the purpose set forth.

Second, Placing the suspended screw, G, on the shaft, H, for the purpose of giving the former the double vibrating movement as described.

[This invention consists in the employment or use of a rotating and two stationary hulling disks and a fan and screen, whereby the desired work, to wit: the separating of clover seed from its hulls may be expeditiously and perfectly performed.]

30,983.—G. W. Pittock, of Union Mills, N. Y., assignor to himself and Merchant Perrige, of Saratoga, N. Y., for an Improvement in Coal Sifters:

I claim the combination of screw shaft, d, revolving sieve, B, lever, a, and hopper, D, when the whole shall be constructed and arranged, substantially as and for the purpose described.

30,984.—I. C. Pratt (assignor to himself and Thomas Parker), of Morton, Ill., for an Improvement in Bee Hives:

I claim the main hive, A, frame, B, and sliding boxes, E and F, when combined in the manner and for the purpose set forth and described.

30,985.—T. L. Pye, of New York City, for Improved Brackets for Curtain Cords:

I claim the divided or split pipe, f, and tapering socket, g, combined with the rod, e, carrying the roller, d. substantially as specified.

30,986.—John Reynolds, of New York City, for an Improvement in Steam Plows:

I claim, first, The arrangement and combination of the plow frame, A, with plows, A', vertical slotted standards, c, link, d, rock shaft, e f, grooved disk crank, g, link, d', chains or cords, J J', and windlass shaft, K, substantially in the manner and for the purpose described.

Second, The arrangement and combination of the fast spur wheel, R, sliding lever clutch, T t t, and loose wheel, C w w v v, substantially as and for the purposes described.

Third, The arrangement of the plow frame, A, with plows, A', boiler, D, engine cylinder, D', wood receptacle, F F1 F2, water tank, E, specified mechanism for throwing the engine in connection with the carriage, B, and the mechanism specified for supporting and adjusting the plow frame and plows, the whole constructed and operating together in the manner described.

30,987.—Ezra Ripley, of Troy, N. Y., for an Improved Wrench:

I claim the manner of adjusting holding and releasing the sliding jaw, C, by means of the set screw, E, in combination with the sliding jaw, C, and inclined plane, D, combined and operating in the manner substantially and for the purpose as described and shown.

30,988.—John Russell, of Troy, N. Y., for an Improvement in Stove Covers:

I claim a stove cover composed of an upper supporting and cooking plate, A, and a lower protecting plate, B, the lower plate being made with ribs, e, on its upper side, and secured to, but apart from the upper plate by means of an intervening block or projection, C, and a bolt or rivet, F, both arranged together at or near the middle of the plates, as shown and specified.

30,989.—J. Ryder, W. Carpenter and H. R. Jolley, of Clinton, La., for an Improvement in Cotton Cleaners:

We claim the combination of the chambers, A B C d e f g, revolving shaft, H, with feed knockers, i i, and fan blades, j j, and the dust flue, G, the whole constructed and arranged and operating substantially in the manner and for the purposes described.

30,990.—Horace Smith and D. B. Wesson, of Springfield, Mass., for an Improvement in Revolvers:

We claim, first, The combination of a revolving cylinder (having its chambers extending entirely through the block) with an unbroken recoil shield having a projection on its face as described for the purpose set forth.

Second, The combination of the barrel hinged to the lock plate with a spring catch, b, arranged with end projections to grasp the barrel and plate substantially as described for the purpose as set forth.

30,991.—John Solan, of Fredericksburg, Va., for Improved Shutter Operator:

I claim the arrangement of the levers, E, having a sliding and vibrating motion on their fulcrum in combination with the slotted and notched plate, H, for opening window shutters and securing them when open substantially as specified.

30,992.—Samuel Solliday, of Sumneytown, Pa., for an Improved Steam Boiler:

I claim the arrangement of the elevated fire box, descending flue pipes, and surrounding water space in combination with the arrangement for the artificial draft and the exit passages, when located within a tight exterior shell or jacket, the whole being constructed substantially as and for the purpose set forth.

30,993.—H. D. Stover, of New York City, for Improvements in Wood Planing Machines:

I claim the combination of cutting cylinder, O, and cross head, M, with two or more screws, E, for raising and lowering the cutting cylinder evenly and parallel to the face of the platen.

I also claim so pocketing or incasing the raising and lowering screws, E, in the uprights, C, that dust and shavings will be effectually excluded whether the machine is in operation or not.

I also claim so constructing the cutting cylinder, O, as to receive four or more cutting blades, P, each imparting a shearing or drawing stroke or cut, and at the same time for convenience in construction, and ease in sharpening and securing the blade to the head.

I also claim forming the portion of the cutter head, immediately back of the edges of the cutting blades, an angle varying from 5° to 45° from the face of the cutting blades, to constitute a solidly variable and efficient cap to the cutting blades.

I also claim so constructing, connecting and arranging the sliding journal boxes, T, with cross head, M, which carries the cutting cylinder O, by means of rods, U, that when the cutter head is raised or lowered these journal boxes will move so as to always retain a precisely equal distance between the drive pulleys and the driven pulleys, on the cutter head, for equal tension of the belts.

I also claim feeding the platen back and forth by friction slide, A', and wheel, D', and rack, B' and pinion, C', for the purposes set forth.

I also claim reversing the movement of platen by means of screw, M', and wheel, O', for forcibly engaging the rack by its pinion, on the friction slide by its wheel.

I also claim sliding, moving and attaching the cross head, M, carrying cutting cylinder, O, on and to the upright, C, in and by adjustable gib slides, N.

I also claim pivoting the journal box, H', for the friction feed shaft, and giving it a vertical adjustment to both swing and raise or fall with the feed shaft.

I also claim several dogs, operated independently of each other, to effectually hold several pieces firmly to the platen, for dressing at the same time, constructed substantially as described.

I also claim sliding the feed rolls into position for use, and removing them from the machine by means of gib slides, so that these rolls are always secured for use and in position out of use by gib slides alone, and yet allow of a free movement, and to require no additional security.

I also claim suspending and moving cross head for cutting cylinder by screws, E, which are suspended in universal bearings and by universal nuts to allow of a free, untrammeled movement for adjustment and ease in operation, and to secure the cutter head parallel to platen at any elevation from its surface.

I also claim a conducting spout or trough, A4, so connected with cross head or other part as to receive and conduct the shavings from the cutting cylinder and the machine to any point desired by means of the current of air set in motion by the great velocity of the cutting cylinder.

I also claim an elastic pressure roll, C4, so combined with a rigid revolving roll, D4, and scraper, F4, that either can be used at pleasure, with the elastic pressure roll, to plane straight and out of wind.

I also claim the iron upright, C, constructed with cavity or pocket for reception of elevating screws, when combined with bed piece of wood planing machine, all substantially in the manner or their mechanical equivalent, for the purposes fully set forth and described.

30,994.—Robert Thompson, of East Davenport, Iowa, for an Improvement in Smut Machines:

I claim the arrangement of the divided scouring chamber beaters, a', shaft, L, fan, M, case, H. and spout, d', with the spout, B, chamber, I, treble and screened shoe, C, grain passage, D, hopper, G, and spout, r; all as shown and described.

[The object of this invention is to effect a more thorough separation, than usual by screening, of the large foreign impurities in the grain, and to more thoroughly separate oats from wheat, the latter grain frequently containing much of the former, to the great detriment of the flour manufactured from it. The invention also has for its object a more thorough separation than usual by a blast of the light foreign impurities which the grain may contain, and also a more thorough cleansing, by scouring, of smut and other impurities which may adhere to the grain and require to be detached and broken or pulverized.]

30,995.—B. D. Tripp, of Moravia, N. Y., for an Improved Device for Guiding Diamonds for Dressing Millstones:

I claim the bar or straight edge, D, attached to the bed piece, A, by parallel arms, g, and actuated or adjusted by the ratchet wheel, b, gearing, c E, and spring, F, in connection with the slide, G, provided with the diamond cutter, H; all being arranged substantially as and for the purpose set forth.

[This invention consists in attaching a bar or straight edge by parallel arms to a suitable bed and adjusting the bar or straight edge by means of gearing whereby the diamond may be made to cut in parallel lines and adjusted to any part of the face of the stone with the greatest facility.]

30,996.—J. J. Watson, William Hardiker and Thomas Toye, of Buffalo, N. Y., for an Improved Apparatus for Ventilating and Warming Railroad Cars:

We claim the employment of the fans, D D, pipes, E and H, flues, P P, registers, F F, dampers, d and e, together with furnace, G, and air space, J, around said furnace, arranged as set forth, for the purpose of supplying heat and for ventilating the car, substantially as is fully described.

30,997.—A. E. Wenzel, of New York City, for an Improved Automatic Lathe Dog:

I claim the combination of the lathe dog, A, and cam, B, substantially as described and for the purpose set forth.

30,998.—Lysander Wright, of Newark, N. J., for an Improved Circular Saw Gage:

I claim the arrangement of the slide, B, way, A, clamp, E, plate, F, hinge, R, and plate, L, connected in the manner and for the purpose set forth.

30,999.—McClintock Young, Jr., of Frederick, Md., for an Improvement in Harvesting Machines:

I claim, first, Making a finger bar of a harvesting machine out of two bars of about the same size and strength, and placed at sufficient distance apart to allow the bolts that fasten the fingers thereto to pass through the space between them, and thus save the boring, drilling and fitting of bolt holes, substantially as described.

I also claim the combination of the yielding plate, F, hinged finger bar, G, and hinged track clearer, J, for the purpose of allowing the finger bar and track clearer, to be swung around, folded up and carried upon the machine, substantially as described.

I also claim the combination of the bar, E, plate, F, lever, L, and brace, M, for holding the finger bar in a horizontal position or allowing it to rise at either end independently of the other end, substantially as described.

I also claim a guard composed of the pieces, j k l, made and united to a finger beam such as described by a single bolt passing through the space between the two bars of which said finger bar is composed, as set forth and described.

31,000.—Henry Essex, of Haverstraw, N. Y., assignor to T. H. Bates, of New York City, for an Improvement in Sewing Needles:

I claim a sewing needle having a cylindrical head and point and a body of triangular or three-sided form, as shown and described.

31,001.—Warren Gale (assignor to himself and B. B. Belcher), of Chicopee Falls, Mass., for an Improvement in Machines for Cutting Straw:

I claim the combination of the stud, D, the carrier, C, and the mouth-piece, A, with the slots for lateral and angular adjustment of the cutter or knife, m m, to the stationary edges, a a a, of the mouth-piece, A A, substantiallly as described.

30,002.—Ferdinand Wuterich (assignor to himself and J. M. Hathaway), of New York City, for an Improvement in Machines for Making Cigars:

I claim,, first, In cigar-making machines, the combination of a concave cylinder to which the two ends of the belt are fastened, and the arched forming rollers and conical belt stretchers, substantially as and for the purpose described.

I also claim making the arched forming rollers of a series of segments or sleeves that can move independent of each other, so as to accommodate itself to the different pressure on different parts of the belt, substantially as described.

I also claim the pointing and finishing mechanism, S T, when operated substantially as described.

I also claim the conical guides and rolls l, and o, for the purpose of keeping the belt in proper position at its edges, and for adjusting the same when necessary, substantially as described.

I also claim forming a chamber in which a cigar of ordinary shape may be rolled up into form by means of a bag in an elastic belt and two arched rollers, substantially as described—not meaning to lay any claim to the belt or the bag formed therein, when used separately from the arched rollers.

31,003.—John North, of Middletown Conn., for an Improved Padlock:

I claim the combination as constructed; the hook case and the attaching the tongue or catch to the tumbler, as a new article of manufacture as in the manner above described.

31,004.—D. P. Shope, of Milesburg, Pa., for an Improved Washing Machine:

I claim the arrangement of perforated soap box, C, with rubbers, I and K, elbow brakes or levers, V U B and B b, and spiral springs, as shown and described, for the purposes set forth.

RE-ISSUES.

Spencer Moore, of Central Bridge, N. Y., for an Improvement in Threshing Machines. Patented Oct. 3, 1854:

I claim, first, The swinging blind, G, fitted in the throat of the machine, to operate as specified.

Second, The guard beam, x, constructed as described, placed in front of the cylinder, and arranged relatively therewith, for the purpose described.

Third, The combination of the guard board, H, and swinging blind, G.

Fourth, The swinging blind, G, guard board, H, and guard beam, x, arranged for joint operation as set forth.

[The object of this invention is to prevent grain and dust from passing upward in the face of the attendant or feeder while feeding the grain into the threshing machine.]

William Van Anden, of Poughkeepsie, N. Y., for an Improvement in Portable Copying Apparatus. Patented Sept. 7, 1858:

I claim a scroll-shaped back or holder, constructed and operated as described, in combination with a book, substantially as described.

J. B. Wickersham, of Brooklyn, N. Y., for an Improvement in Folding Bedsteads. Patented June 2, 1857:

I claim determinining the relative position of the head or foot guards with the side rails, when the bedstead is in an unfolded position, by means of a stop or support, substantially as specified.

And I claim the pins, 5 5, inserted as set forth, in combination with the stops or supports, as specified.

J. B. Wickersham, of Brooklyn, N. Y., for an Improved Folding Bedstead. Patented June 2, 1857:

I claim connecting the wire or metallic work, 6 6, forming the head or foot guards to the cross bar, 2, upon which the parts turn, as set forth.

R. J. Mearcher, of New York City, assignee of J. S. Barber, of Boston, Mass., for an Improved Machine for Cutting Irregular forms. Patented May 15, 1855:

I claim the combination of a table, or equivalent, for rotating the frame to be cut, substantially as described, a pattern of the general form of the frame to be made and two rotating shafts, each carrying a suitable tracer and cutters, one of the said shafts being self-adapting to the outer, and the other to the inner periphery of pattern, substantially as described.

I also claim the employment of two sets of cutters on parallel shafts, so mounted that the distance between the two shafts shall be self-adapting, substantially as and for the purposes specified, in combination with a pattern and tracers, or equivalent means, for determining the oval or other general form, as set forth.

And I also claim, as the invention of the said Ira S. Barber, arranging two cutter and tracer shafts on opposite sides of the axis of the rough frame, and one on the outside and the other on the inside of such frame, substantially as and for the purpose specified.

W. H. Seymour, D. S. Morgan, S. G. Williams and A. Palmer, of Brockport, N. Y., assignees through mesne assignments of J. A. St. John, of Janesville, Wis., for an Improvement in Raking Attachment to Harvesters. Patented May 25, 1858:

I claim the use of two pitmen and a slide interposed between the main driving gear and the rake shank or shaft for the purpose of transmitting motion to the rake from the driving power, substantially as described.

Carlton Newman, of Birmingham, Pa., for an Improvement in Preserve Cans. Patented Dec. 20, 1859:

I claim the arrangement of the flaring flange on the lid, and a rib or ridge on and a groove in the neck of the jar or can, when used for holding the detaching elastic band on the lid or neck of the jar or can, and also for causing the greatest pressure of the band to be directly over the joint for the purpose of hermetically sealing it and excluding the air, as described and set forth.

ADDITIONAL IMPROVEMENTS.

James Saddler, of Egremont, Mass., for an Improvement in Coupling for Thills to Axles. Patented July 24, 1860:

I claim the substitution of the axle itself for the permanent bolt, whereto, in my original specification, the clasps connected with the spring coupling were designed to be attached, thereby doing away with the band and clip and bolt ordinarily attached to the axle.

F. G. Johnson, of Brooklyn, N. Y., for an Improved Composition to Prevent Depredations of Insects. Patented March 27, 1860:

I claim the grinding or pulverizing, to an impalpable dust or powder, of the composition to prevent depredations of insects, invented and patented by me, as aforesaid, substantially in the manner and for the purposes described.

DESIGNS.

E. H. Brown, of New York City, for a Design for Iron Shutters.

E. J. Ney, of Lowell, Mass., assignor to the Lowell Manufacturing Company, for a Design for a Carpet (7 cases).

G. Smith and H. Brown (assignors to Librandt & McDowell), of Philadelphia, Pa., for a Design for a Stove:

Jacob Steffe, of Philadelphia, Pa., assignor to F. and G. Hauck, of Mechanicsburg, Pa., for a Design for a Cooking Stove.

N. S. Vedder and Ezra Ripley (assignors to Potter & Co.), of Troy, N. Y., for a Design for Stove Plates.

N. S. Vedder and W. L. Sanderson (assignor to Potter & Co.), of Troy, N. Y., for a Design for a Stove Plate.

Notes and Queries

K. M., of Ohio.—We have not illustrated the Aneroid Barometer to which you refer. The principle of its operation is the tendency of a curved tube to contract and expand with varying pressures of the atmospheres. We have seen those that were equally as good as a mercurial barometer.

J. W. H., of Iowa.—The specimen of mineral which you have sent us is of no value whatever; it is principally composed of mica. You will find all the information that you want respecting eupolas and extracting silver from the ore in "Overman's Metallurgy."

H. W., of Pa.—There is no power gained by a lever; it is simply an agent for transmitting power.

Y. M., of N. Y.—Mica is composed of silica, 46.3; alumina, 36.8; potash, 9.2; peroxyd of iron, 4.5; fluoric acid, 0.7; water, 1.8. There are many varieties of this substance. The decomposition of a single grain of zinc in a galvanic battery will produce a bright electric spark. The wires of a galvanic circuit should be either soldered or very closely secured by screws to the plates of the battery. A very minute quantity of acid is sufficient for a battery.

W. E., of C. E.—The etchings on articles of cutlery are executed with aquafortis. If you write a name upon the blade of a knife with dilute aquafortis, the metal will be etched. The acid is washed off with warm water. Black sealing wax, dissolved in alcohol, is employed to inlay etched characters on cutlery. The knife may also be covered with wax in every part except the design; then dipped into dilute aquafortis. The wax will protect the portions that are to be kept smooth and bright.

J. P. L., of N. Y.—We have always supposed that stereotype was the same as common type metal.

T. H. K., of N. Y.—We can recommend no other way to economize fuel with your short boiler than by careful firing and the use of a damper in the smoke pipe, so as to retain the heat for a longer period under the boiler.

A. W. H., of N. Y.—An assignment of a patent must specify a valuable consideration, else it will not be legal. If you take out a patent as an additional improvement, the patent will only run fourteen years from the original date. If you obtain a separate patent for the improvement which we advise, the patent will run fourteen years from the date of the issue.

E. G. N., of Ill.—We see no reason why you should abandon your claims. It is our opinion that you would succeed by going into interference with the other party. You had better not give it up if you value the invention.

N. G., of N. C.—The *Mathematical Monthly* is published by Sever & Francis, at Cambridge, Mass., at $3 per annum. It is a very mathematical work, and fully up to the scientific standard. You had better write to your member of Congress to call at our Branch Office in Washington, and get advice about your case. Nothing can be done until the model is prepared; that is the first thing necessary

L. B., of Texas.—We have taken all the required steps to secure your English patent, and in the course of a few days we hope to send you the certificate of provisional protection.

C. A. C., of Miss.—We have written you by mail in regard to your combined Rake and Pitchfork. There seems to be novelty in the plan, but we would advise you to send us $5, and have a preliminary examination made at the Patent Office.

A. M., of Mo.—We have carefully examined the sketch and description of your alleged improvement in Faucets for measuring liquids, and we think it is an ingenious and excellent device for the purpose, and, no doubt, patentable. Send on your model and patent fee, and we will proceed with the case. You will find your several questions about patents fully answered in the "Patent Laws and Information," which we send you by mail.

P. F., of Ohio.—We have seen the statement somewhere published that the Dutch claim the invention of the microscope for Drebell, one of their countrymen. The question is yet a disputed one, and from all that we have read on the subject, we think the discovery not due to any one person.

C. C., of Pa.—We think your apprehension in reference to the ultimate value of patents are not well founded. In case of a dissolution of the Union, there is no probability that the federal government will be broken up, and its jurisdiction will at least extend over all the States that do not secede. Supposing your worst apprehensions should be realized and the Northern and Southern States should separate, we believe all patents granted before separation would be respected in the two sections. In 1859, five hundred and fifty-seven patents were granted to citizens of the Southern States, exclusive of the District of Columbia, and it would be the policy of those States to recognize the legality of all patents issued by the federal government, in order that the rights of their citizens might be respected in all the Northern States. We discussed this matter in our issue of the 15th ult.

R. G. G., of Miss.—As soon as your model comes to hand we will proceed with the preparation of the papers at once. We hope all our national difficulties may be settled before matters grow much worse.

J. C., of Fla.—We are not in the possession of any statistics regarding the friction of mercury in motion.

S. K., of Mass.—If you put a machine into operation before the inventor has applied for his patent, the law would allow you to use that specific machine after the issue of the patent. By procuring a copy of the Patent Laws just published by us, you will have full advice on the subject.

O. B. V., of Ohio.—You will find on another page an article on silver-plating articles of iron and brass.

J. C., of Tenn., and R. M., of Va.—We have received your communications on "momentum," but the author who was criticised has defended himself, as you will see by his communication on another page.

M. H. S., of Iowa.—The mucilage to which you refer is made of British gum or baked starch dissolved in water by thorough boiling.

C. H. J., of Texas.—The crank has "dead points," but no evil results therefrom, because no steam is taken at these points, and a balance wheel affords a most perfect and simple regulator of motion.

R. S. F., of Pa.—A solution of india-rubber in turpentine dries with great difficulty, and would not answer your purpose for books. We think that you can obtain the jet black glossy ink which you desire by mixing common with india ink.

J. C. P., of Ala.—If you put some dry potash in a saucer in the inside of your safe, it will absorb the moisture and prevent your books from becoming moldy. Chloride of calcium is better than the potash, but you probably cannot get it where you reside.

A. T., of N. Y.—Wood has been frequently treated with steam direct to coagulate its vegetable albumen and fit it for seasoning rapidly, when exposed afterwards to the atmosphere.

J. B. & G. S. T., of N. Y.—Good clean copal varnish is used for the wooden handles of the tools to which you refer. As oil is employed in its manufacture, it is the most suitable for articles that are exposed to the weather.

S. M., of Ark.—We do not know where you can obtain a cheap and small sun dial suitable to any latitude.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, Dec. 29, 1860:—

J. B. C., of N. Y., $35; J. H. P., of N. Y., $30; G. W. B., of Mass., $25; W. H., of Cal., $21; L. S. H., of N. Y., $30; M. H. P., of N. T., $15; A. R., of N. Y., $30; J. H. S., of N. Y., $55; S. R. B., of Pa., $25; D. W. S., of R. I., $30; A. G., of N. Y., $60; M. B., of N. Y., $25; N. F., of Wis., $30; P. L. W., of Pa., $25; L. & G., of Ill., $25; A. B. & P. Z., of N. Y., $100; W. H. D., of Ill., $30; L. A. B., of N. Y., $30; W. M. & C. W. H., of Maine, $25; W. B., of N. J., $25; S. & R. W. C., of Ohio, $30; G. & S., of Mich., $125; C. S., of N. Y., $25; J. L. & J. R. P., of Mich., $30; J. H. H., of Pa., $25; N. & A. T. C., of Mich., $30; W. & B., of Cal., $32; C. & L., of N. Y., $25; H. N. DeG., of N. Y., $30; C. H. D., of Ill., $25; J. L. Y., of N. Y., $10; W. B. R., of La., $55; E. & T. S. N., of Mass., $27.

Specifications, drawings and models belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Dec. 29, 1860:—

E. & T. S. N., of Mass.; C. S., of N. Y.; C. H. D., of Ill.; W. B., of N. J.; T. S. W., of Pa.; G. W. B., of Mass.; J. H. H., of Pa.; W. M. & E. W. H., of Maine; J. J. C. S., of Pa.; W. H. D., of Ill.; M. B. of N. Y.; P. L. W., of Pa.; S. R. B., of Pa.; M. H. P., of N. T.; C. & S., of N. Y.

New Books and Periodicals Received.

COAL, PETROLEUM AND OTHER DISTILLED OILS; by A. Gesner, M. D. New York: Balliere Brothers, No. 440 Broadway.

Dr. Gesner is a practical chemist, and has devoted a great deal of attention to coal oils, and has given the name of "Kerosene" to such products. He obtained three patents for making oil from the New Brunswick cannel coal, which he considers a shale, and was the first to commence its manufacture, we believe, in this section of country. He has given us the best illustated and most practical work yet publisaed on the subject, and at some future time we shall refer to it at more length.

Correspondence.

Sewing Machine Controversy at the Polytechnic Institute.

MESSRS. EDITORS:—We ask leave to explain the following statement made by an employé of the Wheeler & Wilson Manufacturing Company (Mr. Wood) on the evening of the 18th inst., at a debating society called the Polytechnic Association, and the doings of which you report:

"Of the 46,243 machines returned to Mr. Howe as sold in 1859, nearly 40,000 made the lock stitch, showing the verdict of the public in this matter."

Explanation:—From October, 1856, to September 10, 1860, Mr. Howe and the Grover & Baker Sewing Machine Company were prohibited from licensing any party to make and sell sewing machines making the Grover and Baker stitch, by a contract inadvertently made, to which the Wheeler & Wilson Manufacturing Company, and I. M. Singer & Co. were parties, and from which, during that time, they refused any release, though frequently requested, both by Mr. Howe and ourselves.

During all this time, therefore, there neither was, nor could be, any party licensed to make or sell machines making the Grover & Baker stitch under Mr. Howe's patent, except the Grover & Baker Sewing Machine Company, while, at the same time, there were never less than 10 licenses to as many different manufacturers to make and sell shuttle stitch or lock stitch machines under Mr. Howe's patent, granted before October, 1856.

Of the 46,243 machines returned to Mr. Howe in 1859, the Grover & Baker Sewing Machine Company alone, made and sold 10,577, while the 10 or more shuttle or lock stitch licencees sold all together the balance of the machines *returned to Mr. Howe*.

Since the spring of 1858 the demand of the public for machines making the *Grover & Baker stitch*, instead of the shuttle or lock stitch with which they had been so bountifully, not to say "clamorously" supplied, became so imperative that a large number of manufacturers commenced the manufacture of the Grover & Baker stitch machines, without license from Mr. Howe or ourselves, though at the peril of prosecution. It is now ascertained from the statements and returns of these last-mentioned manufacturers, made since Mr. Howe's extension, that, during the year 1859, and since, the number of machines made and sold in the United States, making the Grover & Baker stitch, has been much larger than the number of shuttle or lock stitch machines sold in the same time, and that the number of Grover & Baker stitch machines demanded and sold for *family use*, has been at least twice as large as the demand for shuttle or lock stitch machines for the same purpose during the same time.

Mrs. B——, whose statements are given in your report, has been a long time employed by the Wheeler & Wilson Manufacturing Company.

GROVER & BAKER SEWING MACHINE COMPANY,
O. M. POTTER, President.

Important Hints to Our Readers.

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PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

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ents, a very large proportion of the business of inventors before the Patent Office was transacted through your agency, and that I have ever found you faithful and devoted to the interests of your clients, as well as eminently qualified to perform the duties of Patent Attorneys with skill and accuracy. Very respectfully,

Your obedient servant, WM. D. BISHOP.

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A MESSIEURS LES INVENTEURS—AVIS IMPORTANT. Les Inventeurs non familiers avec la langue Anglaise et qui préféreraient nous communiquer leurs inventions en Français, peuvent nous adresser dans leur langue natale. Envoyez nous un dessin et une description concise pour notre examen. Toutes communications seront reçues en confidence.
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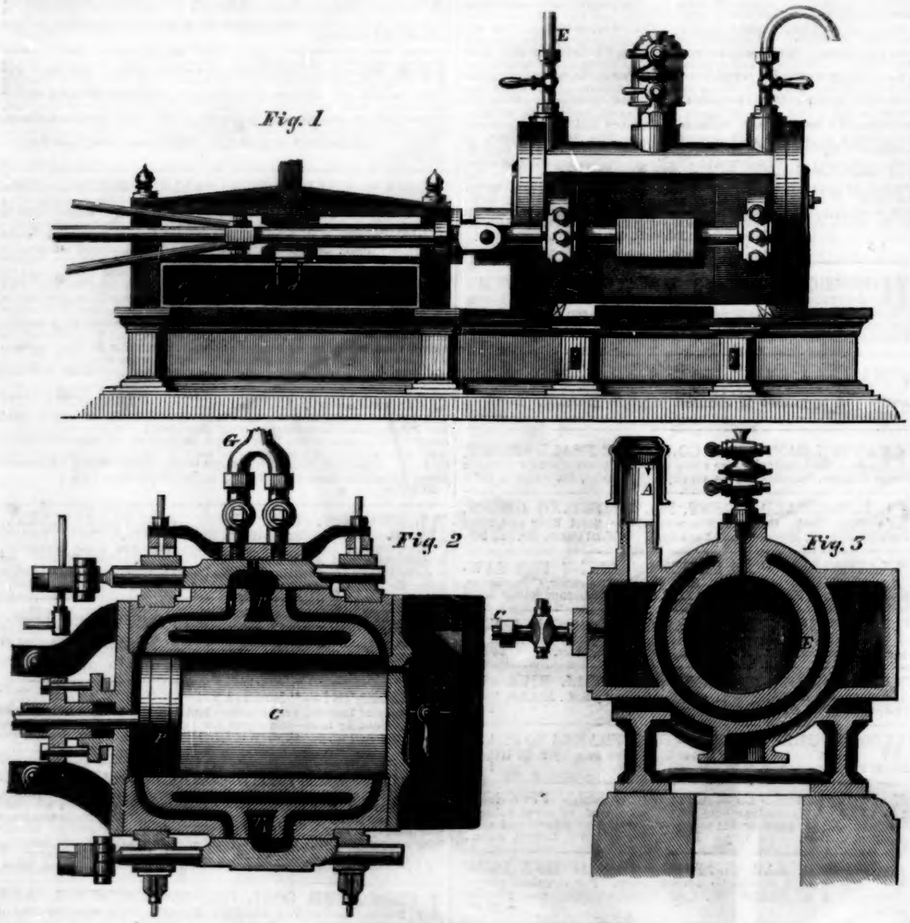
Lenoir's Gas Engine.

In former numbers of the SCIENTIFIC AMERICAN, we have endeavored to correct the numerous statements which have recently been published respecting the explosive gas engine of M. Lenoir which has lately been on exhibition in Paris. It was given out that this was a new motive power superior to steam, and that it would, in all probability, supersede it. We stated that it was, in almost every feature, the identical invention of Dr. Drake, of Philadelphia, which had been on exhibition in the Crystal Palace in this city. Our opinions thus expressed have been verified by the accompanying illustrations of Lenoir's engine, published in a late issue of the London *Engineer*. The motive agent employed in this engine is explosive gas. If one volume of the common gas which we use for illumination be mixed with eight volumes of atmospheric air it becomes saturated with oxygen and as highly explosive as gunpowder; and if a spark of electricity is passed through it an explosion will immediately ensue. The engine here represented is similar in most of its features to a common horizontal one, but it has no boiler, and, instead of steam, charges of gas mixed with air are admitted and ignited alternately behind the piston to give it a reciprocating motion by the expansion which results. Fig. 1 is a side elevation; Fig. 2 is a vertical longitudinal section, and Fig. 3 is a transverse section. C is the cylinder, and P the piston. The cylinder is double, leaving a space around it for a stream of water to keep the metal from becoming too highly heated by the frequent explosions. Two slide valves, T T, are used, and *f f* are the positive and negative wires of a galvanic circuit. The gas is admitted to the feed box of the valves by the pipe, C, and the air by the pipe, A. In the front part of the engine frame are iron rods, *c d*, with circuit breakers and closers on them. The ends of the wires, *f f*, are of platinum, and pass into the cylinder, where they become highly heated when the current of electricity is sent through them. The galvanic circuit is broken and closed alternately for igniting the charges of gas behind the piston by pins on the rods, *c d*, which are operated by a slide on the piston rod. The wires, *f f*, are insulated from the cylinder where they pass through it by means of glass tubes.

In Dr. Drake's engine the gas was ignited by heated platinum cups without the use of a galvanic battery, and this was a more simple method than that adopted by Lenoir. Explosive gas engines are not affairs of yesterday in America, for a patent was granted for one on October 7 1846, to Stewart Parry, which had a water chamber surrounding the cylinder, exactly like that represented in the above figures, and for the same purpose. It is stated that the above engine has been regularly at work for several months at No. 35 Rue Rousselet, Paris, but we deny the correctness of this statement, for the mechanism in the interior of the cylinder must soon become foul with hard lamp black the residium of the gas. Such an engine requires to be stopped frequently and its interior scoured out.



LENOIR'S GAS ENGINE.

Economy of Fuel in Iron Works.

Mr. John Player, blast furnace manager, communicates the following interesting information to the London *Engineer*, regarding the use of the gases formed by the combustion of fuel, either alone or in conjunction with the fuel itself, for cases where a high heat is needed. He says:

About the year 1840, Mr. Farler de Four took out a patent for puddling with the gas taken from the top of a blast furnace. I saw one of his furnaces at work in Wurtemburg, in 1843; it worked very well occasionally, but not regularly; it was like a common puddling furnace, with a stack about 5 feet high. The gas was conveyed to the fire bridge in tubes, and, being met by jets of hot blast (about 400 feet per minute at ¼lb pressure), a welding heat was produced. Many furnaces of the same construction have been since used at various iron works in Germany, Russia, &c., the gas being generated from wood, coal, peat, &c., in a small "cupola," from whence it is forced into the puddling or other furnace, as above described and, I believe, in every instance with great economy.

In Bavaria, where lignite is used, the form of the common puddling furnace is retained, but with a very large fire place; blast is supplied through the ashpit, part of which passes through the bridge and unites with the gas or flame generated by the fuel, and produces the desired effect.

In America, however, I think the greatest effect is produced by the proper combustion of the gas or smoke in a welding furnace. I visited the "Reading Steam Forge," in Pennsylvania, in 1857, at which place the main shaft for the *Adriatic* had just been made; my informant stated it weighed 32 tuns. The furnace in which this mass of iron had been welded was, when I saw it, heating an immense crank. Blast was supplied to the fire by a large fan, and the bars and fire bridge so arranged that a sufficiency of air to consume the smoke was forced through the fuel at the bridge and thus, being highly heated, produced the desired effect. Most of the steel melting works in America use blast instead of the draught of a stack.

Another very excellent plan for the economy of fuel, patented by a Frenchman, has been used for a long time in France at a factory of steel springs. It consists of two fire places, with a hearth between them, on which the steel to be melted or heated is placed; the arrangement is such that the gas or smoke from the fires must descend through the incandescent fuel, whereby it becomes highly heated previous to its combustion in the hearth. Having built and worked one of these furnaces, I can speak to the intense heat produced. Another very neat method of economizing fuel I saw at a glassworks in Saxony, for the manufacture of sheet glass. The coal was consumed in a small square furnace, with five bars at the bottom—otherwise, like a cupola with a closed top; the smoke or gas was conveyed through sheet iron tubes under the floor of the blowing house, and into the bottom of the cone, in which stood six open top melting pots; sufficient air was admitted through small tubes to mingle with the gas to produce the required heat; the air and gas tubes were supplied with throttle valves. The heat was extremely regular; the furnace had been at work about six years at the time I saw it, and, although a colliery belonging to the same proprietor was worked within a few yards of the same premises, yet he told me he had found great economy by the method he adopted.

IT is a noticeable fact that New York has a greater proportion of female artists than any other city in the world. Many of them are very good; some of them rank with the best.